BRNO UNIVERSITY OF TECHNOLOGY
VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

FACULTY OF BUSINESS AND MANAGEMENT
FAKULTA PODNIKATELSKÁ

INSTITUTE OF INFORMATICS
ÚSTAV INFORMATIKY

INFORMATION SYSTEM DESIGN
NÁVRH INFORMAČNÍHO SYSTÉMU

MASTER'S THESIS
DIPLOMOVÁ PRÁCE

AUTHOR — **Bc. Adam Baliak**
AUTOR PRÁCE

SUPERVISOR — **doc. Ing. Miloš Koch, CSc.**
VEDOUCÍ PRÁCE

BRNO 2021

BRNO UNIVERSITY OF TECHNOLOGY
FACULTY OF BUSINESS AND MANAGEMENT

Specification Master's Thesis

Department:	Institute of Informatics
Student:	**Bc. Adam Baliak**
Study programme:	System Engineering and Informatics
Study field:	Information Management
Supervisor:	**doc. Ing. Miloš Koch, CSc.**
Academic year:	2020/21

Pursuant to Act no. 111/1998 Coll. concerning universities as amended and pursuant to the BUT Study Rules, by the Director of the Institute, you have been assigned a Master's Thesis entitled:

Information System Design

Characteristics of thesis dilemmas:

Introduction
Aim of the Thesis
Theoretical Background
Problem Analysis and Current Situation
Proposals and Contribution of Suggested Solutions
Conclusions
References
Appendices

Objectives which should be achieve:

Analyse the current state and effectiveness of the current information system in selected organisation. Design a new information system based on the conducted analysis according to the organisation strategy.

Basic sources of information:

BURNS, B. Designing Distributed Systems: Patterns and Paradigms for Scalable, Reliable Services. Sebastopol: O'Reilly Media, 2018. 149 s. ISBN 9781491983614.

Directorate-General for Informatics. PM² project management methodology guide 3.0. Luxembourg: Publications Office, 2018. ISBN 9789279918292. Dostupné z: doi:10.2799/755246

GRONWALD, K.-D. Integrated Business Information Systems: A Holistic View of the Linked Business Process Chain ERP-SCM-CRM-BI-Big Data. 2nd ed. 2020. ISBN 9783662598115. Dostupné z: doi:10.1007/978-3-662-53291-1

LEBLANC, J. and T. MESSERSCHMIDT. Identity and Data Security for Web Development. Sebastopol: O'Reilly Media, 2016. 188 s. ISBN 9781491937013.

PAUL, D. Business Analysis. 2nd ed. 2010. ISBN 9781780170060.

Deadline for submission Master's Thesis is given by the Schedule of the Academic year 2020/21

In Brno dated 28.2.2021

L. S.

Mgr. Veronika Novotná, Ph.D. Director of the Institute	doc. Ing. Vojtěch Bartoš, Ph.D. Dean

ABSTRACT

This thesis aims to design an information system for an organization. The information system will provide the organization with a unified place to organize their data about their current development projects. The proposed solution will be integrated with other information systems such as CRM, which was chosen as a ready-made solution to reduce the costs. The thesis is divided into three chapters, the first chapter focuses on the theoretical background, the second chapter focuses on analysis, and in the third chapter, a new information system design is proposed.

ABSTRAKT

Táto diplomová práca má za cieľ navrhnúť informačný systém pre vybranú spoločnosť. Tento informačný systém má spoločnosti slúžiť k ukladaniu dát o jej aktuálnych developerských projektoch. Navrhnuté riešenie integruje aj ostatné, už hotové, riešenia ako je napríklad CRM s cieľom znížiť celkové náklady. Práca je rozdelená do troch kapitol, prvá sa zaoberá základnými teoretickými znalosťami, v druhej je vykonaná analýza spoločnosti a v tretej je navrhnutý nový informačný systém.

KEYWORDS

data, information system, analysis, system analysis, security, SWOT analysis

KĽÚČOVÉ SLOVÁ

dáta, informačný systém, analýza, analýza systému, bezpečnosť, SWOT analýza

ROZŠÍRENÝ ABSTRAKT

Cieľom tejto práce bolo analyzovať aktuálny stav v spoločnosti a na základe tejto analýzy navrhnúť spoločnosti nový informačný systém, ktorý spoločnosti pomôže vyriešiť identifikované problémy. Spoločnosť pôsobí na Slovenskom trhu s nehnuteľnosťami ako developer. Už počas výstavby je spustená marketingová kampaň a zákazníci majú možnosť si zakúpiť apartmány a ostatné nebytové priestory v takejto budove. Nápad navrhnúť spoločnosti zavedenie nového informačného systému prišiel potom, čo som v tejto spoločnosti pracoval v rámci externej firmy, ktorá mala na starosti marketingovú kampaň. Všimol som si, že procesy ktoré spoločnosť aktuálne vykonáva obsahujú veľa priestoru pre chyby, nakoľko veľká časť dát o dostupných apartmánoch a priestoroch bola spravovaná manuálne pomocou pracovných zošitov. Toto nakoniec komplikovalo aj zavedenie webstránky na propagáciu novej budovy, ktorá sa aktuálne stavia v meste Poprad. Po konzultácií s riaditeľom spoločnosti uvítal možnosť návrhu nového systému , ktorý sa bude dať použiť aj na nasledujúce projekty.

Na začiatku návrhu bolo potrebné analyzovať aktuálny stav v spoločnosti. K tejto analýze som využil analýzu SLEPTE pre externé prostredie, Porterov model piatich konkurenčných síl k analýze odborového prostredia a analýzu 7S k popísaniu vnútorného prostredia v spoločnosti. Taktiež som využil nástroj ZEFIS a jeho metódu HOS k analýze aktuálneho stavu informačného systému. Táto analýza len potvrdila nevyhovujúci stav aktuálneho informačného systému. Medzi závažné zistené nedostatky patrí absencia bezpečnostnej politiky a fakt že si zamestnanci ukladajú potrebné dáta na svoje zariadenia, čo znemožňuje tieto dáta efektívne zálohovať. Výsledné skóre v oblasti efektivity informačného systému bolo 58%, čo je len mierne viac ako je najnižšia možná hodnota. V oblasti bezpečnosti bolo výsledné ohodnotenie len 50%. Preto som sa v návrhu snažil odzrkadliť tieto výsledky a navrhnúť spoločnosti ako ich môže riešiť.

V návrhu nepopisujem konkrétnu implementáciu návrhu, nakoľko sa jedná len o analýzu a návrh možných funkcií, ktoré by spoločnosti mohli pomôcť vyriešiť tieto nedostatky. Taktiež som sa snažil minimalizovať náklady na zavedenie tohto systému a to tak, že namiesto programovania a zahrnutia kompletnej CRM funkcionality, bude do systému integrovaný už existujúci CRM systém od spoločnosti HubSpot, ktorá ponúka toto riešenie v nami požadovanom rozsahu zadarmo. Toto CRM riešenie poskytuje prístup pomocou

API, čo umožní do tohto systému posielať dáta, ktoré sa zbierajú na marketingových stánkach, kde sa propagujú dostupné apartmány a priestory.

Príkladom môže byť vyplnenie formulára na webstránke budovy, dáta z tohto formuláru sa najprv vložia do nášho systému pomocou volania API a následne sa v CRM systéme vytvorí nový kontakt, ku ktorému sa priradí vložená správa od zákazníka. V CRM systéme sa potom táto správa zobrazí s tým, že zákazník čaká na odpoveď. Doteraz sa takýto prípad riešil posielaním emailov do jednotnej schránky a aj zákazníkovi. Takto budú mať zamestnanci len jedno miesto, v ktorom sa budú takého dáta zhromažďovať a budú mať možnosť priamo z neho odpovedať. To je umožnené napojením CRM systému na emailový server, z ktorého sa budú automaticky sťahovať emaily a priradzovať sa k zákazníkom v CRM systéme. K jednotlivým zákazníkom je potom možné priradzovať v akom štádiu sa práve nachádzajú.

Systém by mal ponúkať možnosť spravovať dáta o jednotlivých apartmánoch a nebytových priestorov. Zamestnanec by mal mať možnosť jednoducho zistiť, ktoré apartmány a priestory môže zákazníkovi ponúknuť. V rámci šetrenia času by mal systém umožniť generovanie zmlúv podľa vopred nastavených šablón. Využijú sa tak Informácie o zákazníkoch je potrebné evidovať pre potreby spravovania budovy. Tieto dáta o zákazníkoch je ale potrebné chrániť podľa platných regulácií ako je napríklad GDPR. Systém by mal ďalej umožniť rozposielanie newslettera pre zaregistrovaných odberateľov, pridávať novinky na marketingové stránky a meniť niektoré ďalšie nastavenia na takýchto stránkach. Systém by mal ďalej umožňovať ukladať dokumenty a potrebné metadáta aby ich bolo možné neskôr dohľadať.

Z hľadiska architektúry sa jedná o aplikáciu s tenkým webovým klientom, logika aplikácie bude uložená a vykonávaná na servery. Aplikácia by mala poskytovať niekoľko API bodov, aby bolo možné komunikovať s ostatnými systémami. Tieto body a ani dátovú štruktúru bližšie nepopisujem, podľa návrhu funkcionality ich navrhne realizátor systému. Výslednú cena za takýto systém som odhadol na približne 10000€, nakoľko je potrebné spracovať aj grafický návrh a integrovať niekoľko systémov. Doba trvania zavedenie je približne 50 dní. Pri zavedení taktiež dôjde k vzniku pravidelných nákladov na infraštruktúru, návrh systému počíta s minimálne troma servermi a to aplikačným, emailovým a zálohovacím.

BIBLIOGRAPHIC CITATION

BALIAK, Adam. *Information System Design* [online]. Brno, 2021 [cit. 2021-05-16]. Dostupné také z: https://www.vutbr.cz/studenti/zav-prace/detail/124792. Diplomová práce. Vysoké učení technické v Brně, Fakulta podnikatelská, Ústav informatiky. Vedoucí práce Miloš Koch

DECLARATION OF ORIGINALITY

Hereby I declare that this diploma's thesis was prepared as an original author's work under the supervision of Mr. doc. Ing. Miloš Koch, CSc. I also declare that I did not breach any copyright in sense of Act. No. 121/200 Coll. on Copyright Law and Rights Related to Copyright and on amendment of Certain Legislative Acts. All the relevant information sources, which were used during preparation of this thesis, are properly cited and included in the list of references.

. . . . . .

Adam Baliak

Brno May 16, 2021

ACKNOWLEDGEMENTS

I would like to express gratitude to my supervisor Mr. doc. Ing. Miloš Koch, CSc., for his guidance and advice while I was creating this thesis. I am also grateful to my family and friends who supported me along the way.

CONTENTS

INTRODUCTION

The idea to propose to the company the introduction of a new information system came after I worked in this company within an external company that was in charge of the marketing campaign. I have noticed that the processes that the company is currently performing contain a lot of room for error, as much of the data on available apartments and spaces has been managed manually using workbooks. This eventually complicated the introduction of a website to promote the new building, which is currently under construction in the city of Poprad. After consulting with the director of the company, he welcomed the possibility of designing a new system that could be used for the following projects.

AIM AND APPROACH

This thesis aims to design a new information system for a selected company. The designed information system should meet the functionality requirements provided by the company. The company is operating in the field of real estates, with strong needs to have one source of information for its employees. Therefore, the information system needs to store records about available units to sell, customers, contracts and should provide reporting functionality as well.

To design the information system it will be needed to conduct a thorough analysis for design to provide a competitive advantage and provide a solution to obstacles which the company is facing. Therefore, it is needed to analyse the external and internal environment in which the company is operating as well as the current state and effectiveness of the current information system.

Goals to be Achieved

- Analyse the internal and external environment
- Analyse the current state and effectiveness of the information system
- Design an information system based on the conducted analysis
- Propose how should be the change implemented

Methodology

I will use the methods and knowledge gained from my work experience and university studies as well. I will adhere to industry best practices where applicable. Analysis of the external environment will include SLEPT analysis and the PORTER model, which will be adapted to the field of information systems. The internal environment will be analysed with McKinsey's 7S framework. The current state and effectiveness of the information system will be analysed with the tool ZEFIS. Analysis results will then be consolidated in a SWOT analysis. The change will be described with Lewin's model of controlled change and schedule with the use of method PERT for calculating time estimates.

1 THEORETICAL BACKGROUND

This chapter aims to provide the essential information for the understanding of the methodology and various technical aspects used to achieve set goals in this thesis, with a focus on the industry best practices.

1.1 Information Hierarchy

The purpose of the information hierarchy is to define what is information, what does it consists of and what can be they be used for. Since this thesis is focused on designing a system that processes data and enables its users to gather information from it, it is essential to understand the differences between these terms.

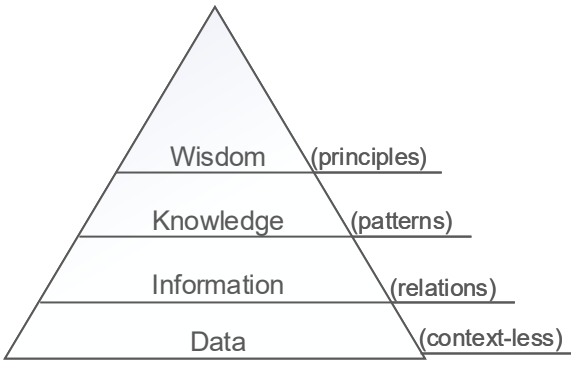

Figure 1.1: The information hierarchy
(Source: based on [3])

1.1.1 Data

„Data are physical signs. They have no meaning because they reside outside of a human mind.“ [3] For example, data can be printed as a letter in a newspaper or a bit in a computer, or a street sign - they are all around us. But data without context are useless, as no information can be gathered from them. If one had never learned how to read the letters, the newspaper would provide zero information. Therefore, a context about what each letter means is needed to gather information from the data. Data can be divided into two types - structured and unstructured. [3]

Structured data

This type of data has a defined structure in which they are stored and presented. An example could be data stored in a database, where structure allows a quick search. Another example could be data stored in a JSON format, which is used for communication between information systems.

Unstructured data

This type is hardly searchable, as they lack any form of structure. They are often accompanied by structured data, so we can understand them. An example could be an image or video bitstream. [3]

1.1.2 Information

Information is a product of the cognitive processing of data. We use our understanding of relations and context to process data and we then gather information from them. In the paragraph above I gave an example that data can be represented by printed letters in a newspaper. In this case, the information would emerge when one reads the newspaper and can understand what each letter means. [3]

1.1.3 Knowledge and Wisdom

Knowledge is the ability to process information and recognise patterns in it. Wisdom combines intuition and experience, so judgements can be made. For example, for a statement like „we should ban plastic straws“ to be made, one has to apply gained knowledge about plastic straws, the environment, etc and understand the underlying principles. Then it is considered wisdom. [3]

1.2 Security Objectives

Security is the protection given to a system or a process, intending to maintain the 3 core security objectives - confidentiality, integrity and availability. These 3 fundamental objectives form what is known as the C-I-A triad, however, it is maybe desirable to expand on these objectives and include another two - accountability and authenticity. [20]

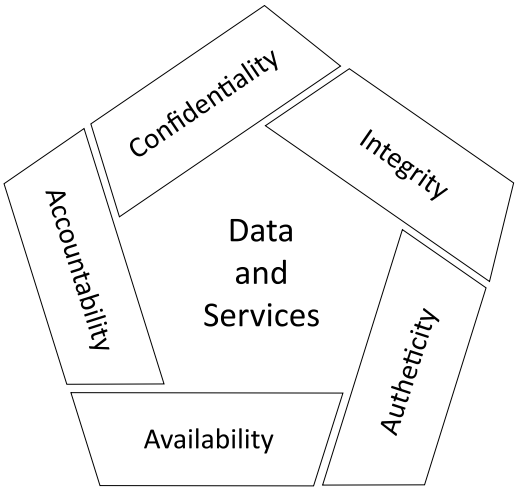

Figure 1.2: Essential security objectives
(Source: based on [20])

Confidentiality

Confidentiality means ensuring that unauthorized entities cannot access confidential data. An example of achieving confidentiality is encryption. With the current state of technologies, encrypted data cannot be accessed without the key used to encrypt them. From a privacy perspective, confidentiality means that an entity has control over what information is collected, stored or processed. [20] This approach to confidentiality is described in-depth the Chapter 1.3.5.

Integrity

Commonly used with regards to data, where it dictates that data can only be changed in a way that the user intends to do so and in a deterministic manner. System integrity means that the system is behaving in an intended way, without unauthorised modifications to its behaviour. [20]

Availability

Refers to the property of a system to be available when needed with reasonable waiting times. This is more of an operational objective, as ensuring that systems are available is requiring preparation. Availability can be affected by scheduled downtimes or by an attack on the infrastructure of the system - for example a DDoS attack. [20]

Accountability

Accountability is the ability to trace an action back to a user. This objective can be achieved by keeping a log of actions performed by each user, access attempt and such. Should an unauthorised 3rd party gain an access to the system, it should be possible to detect this breach, even if not in real-time. [20]

Authenticity

Authenticity is the property of genuineness and trustfulness. If something is authentic we can trust that it is what we think it is. Authenticity is achieved by verification of unique properties. A common form of verifying is the use of credentials. [20]

1.3 Data Protection

From a data protection perspective, we recognize two types of data. Data at rest and data in motion. These types of data differ by the methods that are used to protect them. However, protecting data does not include only protection from unauthorized access, it is also needed to prevent the loss of data. There needs to be a backup routine set up, and protocols about what to do in case of a data loss incident. Moreover, there is a legislative which dictates additional obligations with relation to personal data. [9][12]

1.3.1 Data at Rest

Simply put, data at rest are „resting“. These are the data that are stored, for example in a database, or any other application data. It is critical to protect these data. Although several methods can be used to protect data at rest, they are rarely implemented. One of these methods is database encryption. This method aims to protect the data by encrypting the database with a strong algorithm such as AES or RSA. In case that the database is encrypted and the database server is compromised, an attacker can gain access to the database files stored on disk, but these would be unreadable without the private key. However, there few critical standards which have to meet, otherwise it will be easy for an attacker to decrypt the data. The private keys which have been used to encrypt the database, have to be stored separately from the database - e.g. not on the same server. They should also be rotated for new keys periodically. [9]

It also recommended limiting the amount of personal data that is collected. Nowadays it is common practice to hoard as much data about a user as possible. By limiting the amount of stored data, we are essentially reducing the impact of a database leak.[9]

1.3.2 Data in Motion

Data in motion are data that are currently in transit. When an information system makes an API request to another system, or when a browser sends a payload to a webpage, for example when a user is logging in. These data are then transmitted over the internet and they can be easily intercepted and read if not protected. The most common form of protecting the data in motion is using only secure connections (HTTPS) to communicate with other parties. [9]

Secure connections are a strong improvement, but they offer only partial protection for a user from a man-in-the-middle attack, where the attacker redirects the user's traffic through his machine and relays it to the originally requested party. There is also a security concern of using an unsecured access point to access the information system. Data transmitted over these access points can be read by anyone in the vicinity of the user. A secured encrypted tunnel, a VPN, has to be used to protect the user even on an unsecured network. A VPN creates an encrypted connection to the specified server and routes the user's traffic through that connection. [14][9]

1.3.3 Backup

„A backup is a copy of data stored separately from the original and used to restore that data to its former state, usually after the data has been deleted or damaged in some way.“ [6]

Backing up data is a critical process to ensure that at least a copy of data can be accessed after they are no longer available. Copy in this context means a byte-for-byte reproduction of the original data. It is important to acknowledge that data backup has to be independent of the original data. If for example a snapshot of a server filesystem is taken, then this is not a true backup as it cannot be used to restore the server if the server system itself gets corrupted. The next critical step of backing up is to move the created backup to another system. If the backup stays on the same machine or the same disk, it

will not be accessible in case of hardware error. Lastly, it is crucial to verify that created backup can be used to restore the data by trying a recovery for this purpose. [6]

The 3-2-1 Rule

The 3-2-1 rule is the essential rule when it comes to backups. The 3-2-1 rule states that should be at least 3 versions of data, stored on two different media and 1 should be (geographically) located somewhere else. By having at least three versions of data backed up, it is possible to restore not only to the most recent version but to the version which is currently needed. This can help mitigate the impact of ransomware, where it is needed to restore to the version of data that has not been infected yet. Two different media means refers to the problem that backup stored on the same media as the original will become inaccessible at the same time. Lastly, located somewhere else protects from, for example, a datacentre fire. If the backups were stored in the same location as original data, in case of a fire they would be destroyed together with the data. If the backups were to be stored in the cloud, it is important to check where they would be psychically located. Storing backups with a cloud provider in the same town does not count as located somewhere else. [6]

1.3.4 Archive

„An archive is a copy of data stored in a separate location, made to serve as a reference copy, and stored with enough metadata to find the data in question without knowing where it came from.“ [6]

The main difference between backup and archive is the purpose for which they were created. With backups, the objective is to restore the data to its original form. Archives are created to locate data by their properties - metadata. Consider a scenario where it is needed to retrieve an important document, but only a date when it was created is known. One option is to restore a backup from that date and look there. Instead of using backups, an archive can be used to locate that document by searching for documents with that date. [6] An example of an archive could a document management system (DMS).

1.3.5 General Data Protection Regulation

General Data Protection Regulation - GDPR - is a legislative framework that governs how personal information has to be protected. It is valid in all European Union (EU) member states, without the possibility of further customization by individual members. It sets rules for processing personal information and where can be this type of information stored. It aims to prevent unauthorized usage of data and personal information, as well as unify existing inconsistent rules across the EU. [12]

Personal data is considered to be every information about a person which can or cannot be identified. Identification can be done by using identification such as a name, number or network identification, or a unique psychical treats can be referenced. [12]

GDPR brought new obligations for entities that are processing or storing personal data, they include: obligation to maintain records of processing, an obligation to report any breach of personal information to a regulatory organ and also to an affected entity. Maintainers of personal data are obligated to seek approval from the person before processing their data, which can be withdrawn at any time, resulting in an obligation to remove all of the collected data. Another significant obligation is with relation to the geographical location where are the data stored. Before the data can leave the EU a consent has to be provided. [12]

Failure to comply with these rules can result in a fine, which is calculated from a yearly gross income, if the subject is a company, the maximum amount is 20 000 000€. [12]

The regulators are recommending that all of the data that isn't essential be either: anonymized or pseudo-anonymized - by removing identification treats or encrypted - preventing access to the data by unauthorized entities. By proactively removing personal data, an organization can lower the impact which could potential data breach have. [12]

1.4 Information Systems

This section describes types, architecture and life cycle of information systems. We will focus on the CRM and ERP systems.

1.4.1 CRM

The CRM (Customer Relationship Management) system focuses on connecting the organization's information system and external processes co-owned by the company's customer and takes care of managing these external processes such as contacts or marketing, sales or warranty or after-sales service processes. The main goals of the CRM system include providing tools for effective communication with the customer. [17]

1.4.2 ERP

The ERP (Enterprise Resource Planning) systems aim to consolidate, integrate and automate different processes and data in an organization.[13] Before the concept of ERP there were many specialised solutions offered on the market. Each specialised in its field, for example, a system for finance, manufacturing, inventory, etc. The level of integration and automation was low. With the onset of ERP, it has become the principal system in many IT strategies. [11][13]

The benefits of ERP systems for organizations undoubtedly include a reduction in the cost of running an organization or business. The reduction in costs is due to more efficient management of business processes and accelerated access to information (availability of information in real-time). It is also important that the ERP system is powerful, reliable and secure. To ensure these aspects, an n-Tier architecture is used using powerful hardware and software. The security of a given system is, of course, affected not only by the system itself but also by the security policy of the organization. [13]

1.4.3 n-Tier Architecture

This architecture model breaks the system into multiple layers, typically three. The first one is a presentation layer or generally referred to as frontend, which focuses mainly on presenting data and obtaining input from users. This layer should not include any business logic, because it could be modified by a competent user. Data, meanwhile, are stored on one or more data servers in the data layer. This layer contains only logic that is essential to access the data and preserve its integrity - it could be for instance a set of predefined procedures, transactions, triggers. All of the business logic is held at the middle layer - the

backend - which processes the user input, retrieves and returns the requested data when the user accessing data is authorized to do so. [10]

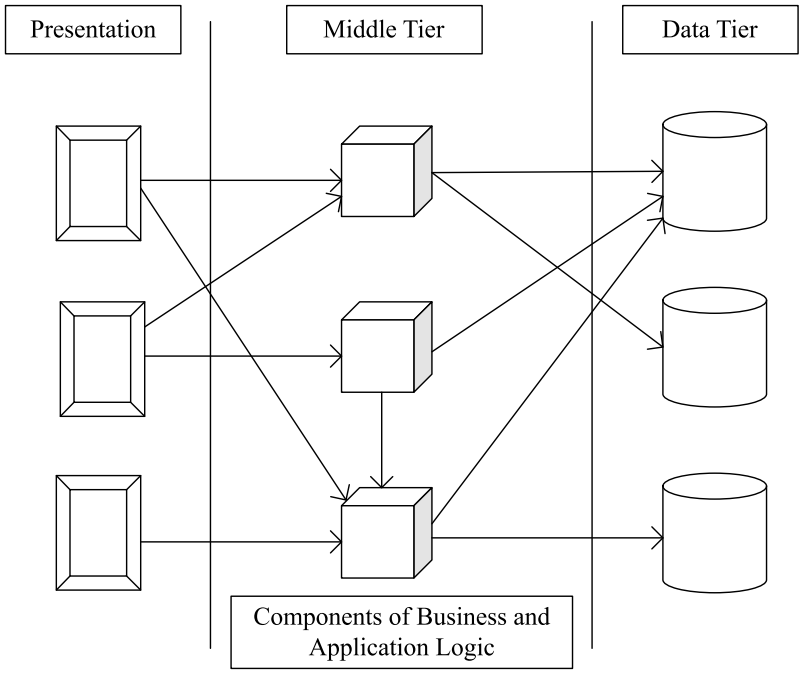

Figure 1.3: n-Tier architecture
(Source: based on [10])

Splitting the application into separate layers, and retaining the business logic only at one is useful for integrity and keeping the application code simple. The simplicity comes in a way that when a bug is found, a software developer only needs to look for it in one place rather than multiple systems.[10]

1.4.4 Life Cycle

The life cycle of an information system is a time period, which begins with the inteeention to create an information system, and ends when that information system is decommissioned. Over the years there have been many concepts, but the most used are waterfall and iterative models which will be described in this section. [5]

Waterfall Model

The waterfall life cycle model has its roots in industrial manufacturing. The waterfall model divides the development of an information system into a chain of phases, which

are executed one by one. This model has got its name because when visualized like in the figure 1.5, it looks like a waterfall. [5]

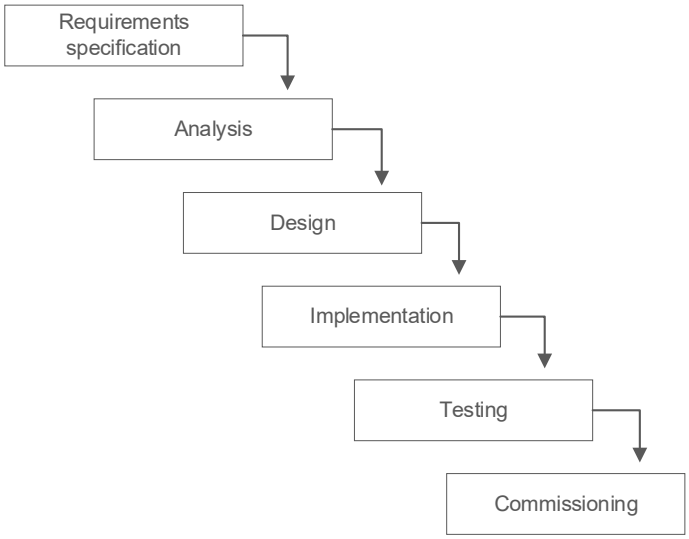

Figure 1.4: The waterfall model
(Source: based on [5])

The waterfall model enables a systematic approach to development but is often criticized because it is not flexible. On the other hand, it is still used in many projects, as it provides a good overview of work that is needed to finish the project. However, in order for this model to provide these benefits, the requirements should not be significantly changed over the course of development as this model isn't flexible. Therefore a thorough analysis of requirements has to be conducted before committing to this model. [5]

The main drawback of the model is that since the program components are integrated at the end of the implementation phase it is often too late when we discover an error that requires changes to the design. This situation delays the commissioning. Another consideration is the involvement of the customer in the process. In this model, the customer is typically involved only at the start and at the end. [5]

Iterative Development

The iterative development aims to improve on the waterfall model. The waterfall model looks at a system as one problem, where the iterative development breaks down the process into multiple subprojects which then undergo every phase as they would in the waterfall model. [5]

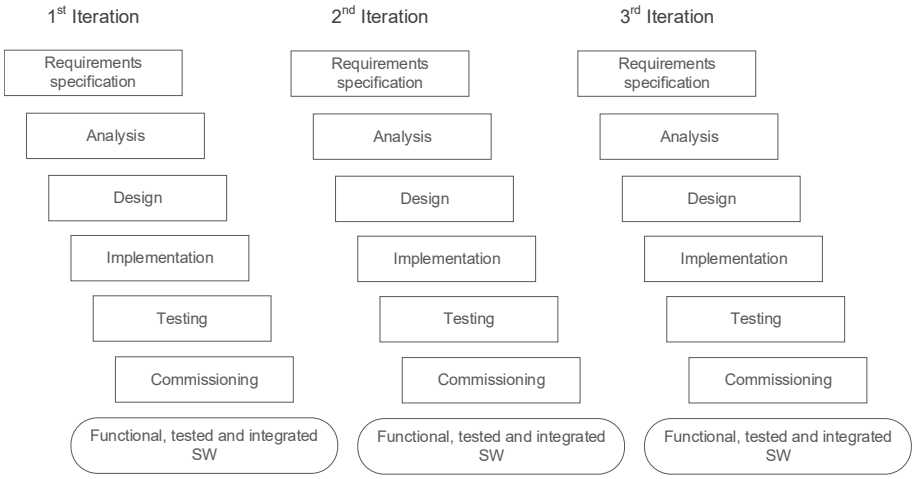

Figure 1.5: The iterative model
(Source: based on [5])

This approach brings multiple benefits as not only can the customer be more involved with each iteration, but also the team is tested if it can realise the solution as was designed. If there would be some issue with the design or integration then, contrary to the waterfall model, the team would discover this issue sooner than at the end of the whole project and the design could then be changed. The ability to discover issues sooner reduces the risks involved with the development of an information system. [5]

Another benefit to the customer that can increase their satisfaction is that a working piece of software is delivered after each iteration. Therefore, the customer can provide feedback and raised issues can be implemented in the next iteration. Should the customer want to change some requirements, this model provides more flexibility for this problem. [5]

The iterative development can be realised with the incremental and evolution models. The incremental model defines the rough requirements at the beginning of development. The system is then broken down into components, which are then developed individually and are afterwards all integrated into one system. For the incremental model is critical to select the right size for each component and the ability to develop each component separately, without dependencies on other components. The evolution model differs from the incremental by defining the requirements at the start of each iteration. [5]

1.4.5 Associated Costs

Implementation of a new information system, whether it is a complete out-of-the-box solution or a custom made, introduces a considerable cost to the organization. This cost is traditionally viewed as one of the most important factors when deciding between offered solutions. The cost generally follows the trend of more functionality means a higher price tag. [4]

The costs of the information systems can be split into two categories: [4]

One time costs

→ hardware

→ software licences

→ data migrations

→ training

→ customization of exisiting solution

→ modification of processes

→ and with the custom made information system: development costs

Recurring costs

→ hardware maintenance or lease

→ software maintenance fees

→ consulting services

→ providing support (may be internal IT department, or external)

1.5 Analytical Methods

These methods are used to conduct an analysis of the internal and external environment in an organization as well as to evaluate the effectiveness of its current information system and processes.

1.5.1 McKinsey 7S Framework

In recent studies, the McKinsey 7S model is described as a tool for analysing organisational and managerial actions by observing the organisation as a whole with the intention of identifying organisational problems to be diagnosed and strategies to be developed and implemented. The model was developed to set focus and lay emphasis on internal and external environment as well as customer satisfaction. In theory, this model assesses the organisation with the use of seven components in the framework that it is broken down into hard elements and soft elements. Hard elements are often easily identified and viewed through managerial actions such as strategy, structure and system. While, soft elements such as shared values, skills, staff and leadership style are in practice harder to identify due to their dynamic changing nature that are vastly reliant on individuals within organisation. [16][7]

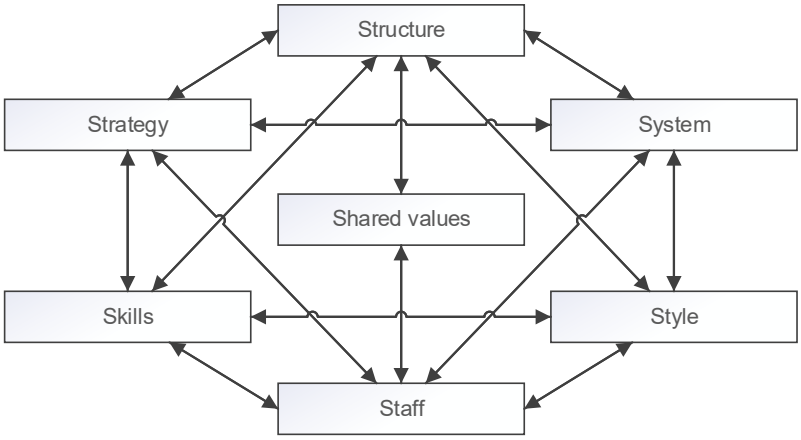

Figure 1.6: McKinsey 7S Framework
(Source: based on [7])

Strategy

Strategy defines actions a company plans in response to changes in its external environment. It also looks at the ways in which organisations will achieve competitive advantage. Therefore, it is important that there is strong, concise and tailored strategy for the organisation. If the strategy is not constantly articulated it appears to not have powerful source of influence. [7][18]

Structure

Structure explains basis of specialisation and co-ordination influenced primarily by strategy, size and diversity of organisation. [7]

Systems

Systems outlines formal and informal procedures that support the strategy and structure which includes management control systems, resource allocation systems, budgeting, planning, information systems and performance measurement and reward systems. This element of the framework plays important role in influencing people's behaviour. People are the drivers who has an influence on resources available for department and the processes by which individuals are rewarded and group measured. [7][18]

Shared Values

Shared values are built upon guiding concepts, fundamental ideas around which a business is built must be simple, usually stated at abstract level, have great meaning inside the organisation even though outsiders may not see or understand them. [7]

Style

Style as element of the framework focuses on style of leadership which describes the process of influence on other in order to direct their efforts to reach specific goal. Alternatively, leadership is commonly defined as an activity for influencing behaviour of staff within organisation. This factor also focuses on dominant values, beliefs, and norms which develop over time and become relatively enduring features of organisational life. In addition, it deals with managerial matters and often involves questions, for instance, how do managers treat bottom line staff; what managers do than what they say; how do company managers spend their time; and what are they focusing on. [7][18]

According to Iowa University research, there are identified three styles of leadership as follows:

- Autocratic style – leader has the role for making decision and taking responsibility
- Democratic style – leader allows staff to express their opinion even though in making decision, leader's opinion is prioritised

- Laissez faire style – leader consents member of organisation to make decision [18]

Staff

Staff involves people/human resource management which deals with processes used to develop managers, socialization processes, and ways of introducing young recruits to the company. [18][7]

Skills

Skills describe the distinctive competences and look at what the company does best. [7]

1.5.2 SLEPTE Analysis

SLEPTE is an analysis of the external environment in which the organization is active. It consists of these areas:

- S - Social factors - demographics of the audience and other social characteristics
- L - Legislative factors - current legislation that the organization has to comply with
- E - Economical factors - macroeconomic factors that can affect the organization
- P - Political factors - political climate and decisions that can affect the organization
- T - Technological factors - the level of technology use in the industry
- E - Ecological factors - impact on environment, if applicable in the industry [16]

1.5.3 Porter's Competitive Forces

Porter's competitive forces model is used to analyze the forces acting on the organization that originate from its industry. Five forces can act on the organization at the same time, but even just one can be significant enough. [19] This model can be applied to the information system and can provide insights into what competitive advantages the current information system or the use of a new information system provides. [4]

Competition in the Industry

Examines how strong the rivalry is in the industry. This rivalry can depend on many factors, such as the number of competitors, the type of product sold, the presence of

barriers to entry, and the market share of each competitor. These factors are known as competitive advantages.[19] A competitive advantage can be created by using a new information system. [4]

Potential of New Entrants Into an Industry

Examines how easily a new organization can enter the industry and become a competitor to our organization. This force is influenced by existing barriers that prevent entry into the industry. These must be overcome, which increases the cost of entry. The presence of these barriers determines the profitability of the industry. [19] In the context of the information system, it can be studied whether the system helps to create new barriers to entry for potential entrants. [4]

Power of Customers

Customer power is the power that customers have over the price of the product. This power depends on factors such as the volume of orders, the nature of the market, the ability to buy from multiple sellers at the same time, or the existence of a lower price by another competitor. [19] The organization can consider whether the use of a new information system will help to change this force to its advantage. [4]

Power of Suppliers

Power of suppliers is determined by the presence of substitutes for their products, insignificance of the industry to the supplier, or high specialization of suppliers. If the organization has few and specialized suppliers of inputs that cannot be substituted, then the power of suppliers to determine their prices is high. [19] The organization can consider whether the use of a new information system will help to change this power to its advantage. [4]

Threat of Substitutes

This power exists when there is the possibility of creating close substitutes for an organization's product. If a substitute can be created, an organization must provide additional value to customers. This often leads to price competition. [19] From an information system perspective, it can be analyzed whether the information system helps the organization create new products. [4]

1.5.4 ZEFIS

ZEFIS is a tool used to evaluate the effectiveness of a system or a process in an organization. The method used for evaluation is called HOS8. It provides the user with a questionnaire that contains carefully selected questions aimed at determining shortcomings. After the questionnaire is completed ZEFIS then analyses provided answers and evaluate the effectiveness in these areas of an organization: [8]

- Hardware - evaluates psychical equipment in relation to its reliability, security and
- Orgware - how well are processes and rules for operating an information system defined
- Software - what software is used, its functionality and ease of use
- Peopleware - evaluates users of the information system and the development of their abilities, also the level of support provided
- Dataware - evaluates how are data secured, stored and used in an information system
- Customers - what benefits does an information system provide to customers, external or internal if applicable
- Suppliers - what are information demands from suppliers for the system to provide its functionality to customers
- Management IS - evaluates the management of an information system with regards to the information strategy and how are set rules enforced [8]

Every evaluated area is then assigned a score on a scale of 1 to 5, low and high level of development in that respective area. An overall score is then determined by selecting the lowest score achieved in all of the areas. The minimal score is used because the system is viewed as a chain with strong and weak links, where one weak are decreases overall effectiveness. [8]

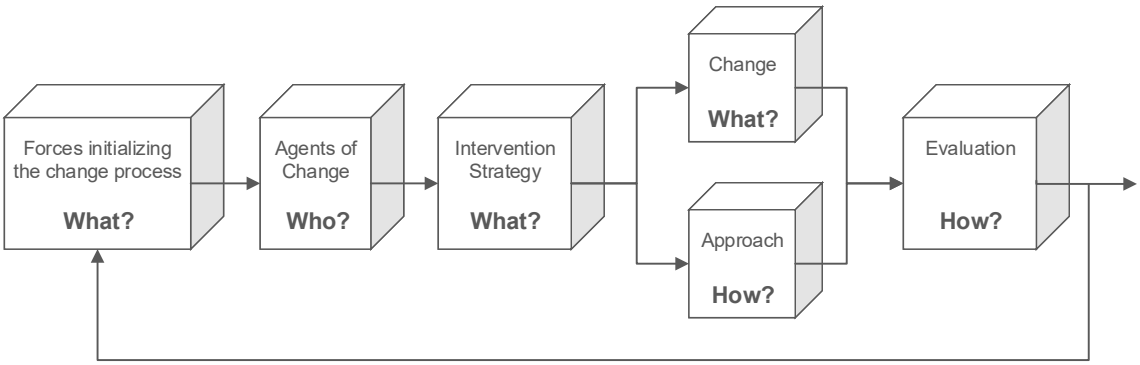

Figure 1.7: Lewin's model of controlled change
(Source: based on [16])

1.5.5 Lewin's Model of Controlled Change

Lewin's Model of controlled change is a framework used to describe necessary steps for a successful implementation of change in an environment. It is based on Lewin's findings that implemented changes can have a short lifespan if their implementation has not been thoroughly planned.[16]

According to Lewin, a successful change consists of three phases:

- Unfreezing phase - breaking the status quo in the environment, old habits and rules in the group have to be removed, gathering support for the change from interested parties [16]
- Change Phase - project, a series of dependent activities are executed to achieve the desired state [16]
- Refreezing Phase - implemented changes have to be refreezed, omitting this phase can lead to the return into the initial state before the change [16]

1.5.6 SWOT Analysis

SWOT analysis is a tool that is used to integrate previous analysis. SWOT is an acronym for Strengths, Weaknesses, Opportunities and Threats. Significant findings from conducted analyses are added to one cell according to their effect on an analysed organization. They are divided into groups based on their origins - internal or external - and their adverse effect which can be positive or negative. The structure is shown in the figure 1.8. For each field, up to 5 most significant findings can be selected, although it is not always possible

to find that many relevant findings to fill each group. Sorting findings based on their origin helps us to analyse the relationship between analysis of the external and internal environment. [19]

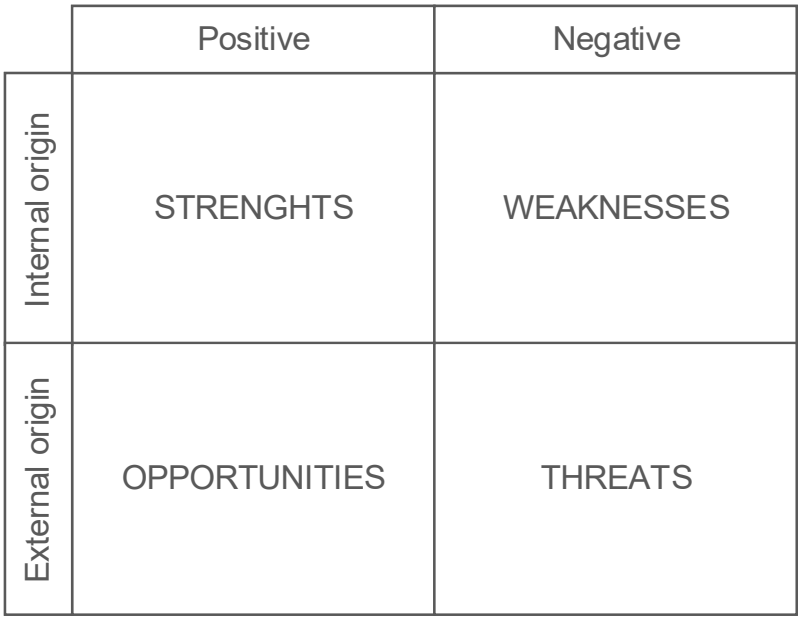

Figure 1.8: Structure of SWOT analysis
(Source: based on [19])

1.5.7 PERT

PERT - Program Evaluation and Review Technique - is a method used for evaluating and conducting time analysis which includes stochastic time evaluation of individual activities in an analysed project. In this method, the length of an activity is determined by using probable, pessimistic and optimistic estimates of the duration of activities. The expected duration is then calculated as a weighted average of provided estimates. The main benefit of this method is that it does require deterministic inputs and can work with uncertain estimates. By conducting time analysis it is possible to discover which activities are critical, meaning that delaying them will result in delayed completion of the whole project. [21]

2 PROBLEM ANALYSIS AND CURRENT SITUATION

This chapter focuses on introducing the organization Karpatská Residence s.r.o., and analysis of its external, as well as internal environment. This analysis will be conducted with the use of methods mentioned in the chapter 1. Furthermore, I will also evaluate the effectiveness of the organization's current information system. Findings from the analysis will be summarized at the end of this chapter.

2.1 Company profile

The organization that I have chosen for this master's thesis is operating in the real estate market, more specifically as a developer of real estates. It is a subsidiary of a large estate developer in Slovakia. Karpatská residence s.r.o. focuses on the development of a large apartment complex in the town of Poprad in Slovakia, which is located near the High Tatras. This town is frequented by tourists which are seeking accommodation here, for the duration of their vacation in the mountains.

Figure 2.1: Logo of the company
(Source: the company website [1])

Company name: Karpatská residence s.r.o.

Type: Limited liability company

Identification number: 51 425 297

The organization was founded in the year 2018, after the completion of plans for developing a new estate in Poprad. The apartment complex is currently in its second phase, with secured funding and the first building of this complex is already being built. I was originally contracted to work on a marketing campaign for this complex, but after

working with the organization I did notice that they lack any form of information system that would help them keep track of customers, apartments, deals and more. The inefficiency was discovered when I needed to source data for the homepage of this complex. Since most of the work was done manually with the help of spreadsheets, I proposed a plan for the development of a system that would help resolve these issues and make their processes more effective.

2.2 SLEPTE Analysis

https://www.mbaskool.com/business-concepts/marketing-and-strategy-terms/8377-slept-analysis.html

2.2.1 Social Factors

The organization is operating on a Slovak real estate market. The town of Poprad, where its newest development project is located is favoured by tourists because of its proximity to the High Tatra mountains. Tourism plays a big role in the demand for real estates in the town. These are bought not only as a necessity for a living but also as an investment. Poprad has a wide range of types of people at different levels of society, but real estate is also very attractive for large domestic or foreign investors.

Demographically, the town of Poprad is still evolving. In the years 2000 to 2004, Poprad was one of the districts with the largest natural decrease in population, but in the years 2014 - 2018, it improved and achieved an increase, albeit minimal. On the contrary, Poprad is one of the districts with the highest values of migration growth, which points to the attractiveness of its environment and is also one of the youngest districts in Slovakia. [15]

The organization has also brought a lot of capital to Poprad and offers employment to many citizens of Poprad as well as the surrounding municipalities. It also offers work to a large number of self-employed or small entrepreneurs, thanks to which the company's popularity is growing. The company's popularity is also associated with the fact that the area where this project will grow was unused for many years after the unsuccessful department store project. The citizens of Poprad are therefore grateful to the developer that this space will be able to be used again, and as this is a lucrative location near the city centre, it will benefit the city skyline.

2.2.2 Legal Factors

Any organization operating in the Slovak Republic must comply with its laws. We cannot say that the Slovak Republic offers an ideal environment for business. Its laws and regulations are often confusing and very often updated, which often leads to ambiguities and possible sanctions only due to inattention or late reaction.

The organization must pay attention to the Commercial Code as well as the Labor Code. Where one determines the conditions and rules of its business activities and the other limits its rights and obligations concerning employees. With the fact that the company processes and stores the personal data of its employees as well as clients, it must also pay attention to the GDPR, which determines how to handle such data. However, the biggest influence on the company's operation is the building law, which determines the norms and standards that it, as a developer, must ensure and meet.

The organization is also affected by the law on environmental protection, which creates some obstacles in its business and operation. On the other hand, the company feels a strong social commitment and strives not only to comply with these laws but also to carry out its activities as environmentally friendly as possible and with the least possible impact on the environment.

2.2.3 Economical Factors

We can rank economic factors among the most important ones, as the goal of every company is to generate profit. As the company operates in the real estate market, it is influenced by a large number of economic factors. The main ones are unemployment, the level of the minimum and average wage, as we can at least roughly define the purchasing power of the population from these factors.

The average wage reached 1133€ in 2020, so we can talk about a year-on-year increase of about 3.8% despite the coronavirus pandemic. Unemployment in Slovakia fell below 5% in 2019, but then in 2020 with the arrival of the coronavirus, it reached the level of approximately 7.5% and currently in 2021 it is approaching the limit of 8%. This development is not ideal for the company, as the sale of apartments is also related to the interest rate and the ability to finance the purchase with a mortgage loan. [22]

With the annual percentage rate on a mortgage loan, it is clear that the central bank aims to encourage people the purchase real estate by reducing interest rates. It has been declining since 2009, where it was at a level of almost 5% to a value of almost 1.3%, which it currently reaches in 2021. [2]

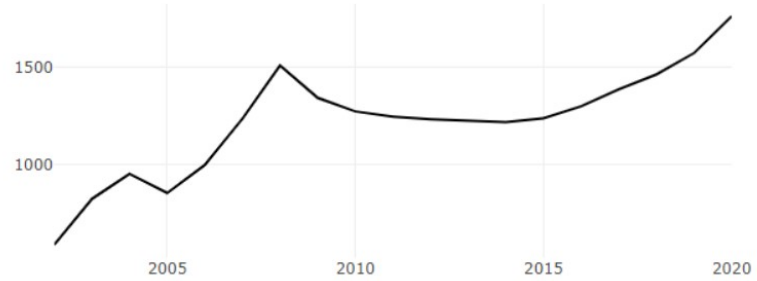

Figure 2.2: Development of real estate prices in € per m2 from 2005 to 2020.
(Source: [2])

It is clear from the graph 2.2 that prices have a rising character and also the prediction of these prices shows that real estate prices should not fall, but rise continuously and steadily. Of course, this rise in prices may be affected by a pandemic, but the forecasts of many experts are clear and there is no need to worry about a decline or stagnation in the real estate market.

2.2.4 Political Factors

The Slovak political scene can be described as long-term unstable and turbulent. This is evidenced by many political cases, which are associated with the highest political figures, but also with people from the judiciary and the police. After the elections in 2020, there was a complete exchange of government political parties, when parties that do not have much experience came to power. This political coalition is characterized by a balance between right-wing and left-wing views and aimed to create a suitable environment for business and to simplify the life of small entrepreneurs as well as self-employed persons as much as possible.

Unfortunately, with the new government came a pandemic, which changed the priorities of this government and the creation of a suitable business environment had to go second. The pandemic also brought many restrictions, with which not only the construction but

also the sale of real estate slowed down, which had a direct impact on the functioning of the company.

Although the company operates in the private sector, it is influenced by many legislative factors that tend to be related to the political cast. Every new government tends to mean new faces and new opinions or priorities. Therefore, as mentioned in the context of legislative factors, the laws in Slovakia are often amended and adapted to suit the current political population.

2.2.5 Technological Factors

Technological factors are others that intensively affect the industry in which the company operates. If the company did not use the currently available technological conveniences, its activities would be very expensive and at the same time, they would not have to comply with current trends, regulations or standards.

Not only technological factors of construction but also modern trends in information technologies are related to the company's operation. We can consider Slovakia as a country with a good level of informatization and high standards for information systems. If the company did not follow current IT trends, it is possible that it would become uninteresting for clients and at the same time for investors.

Of course, the company is also involved in the development and constant development of software and hardware for smart homes. They offer a high level of housing, security and simplify many daily activities. More and more companies, such as Apple and many others, are joining these areas.

2.2.6 Ecological Factors

Lately, everything revolves around ecology and the impact of companies on the environment, no matter in which area the company operates. The greatest emphasis is placed on reducing waste and at the same time on the use of renewable resources. The company is currently very sensitive to the smoothing of green areas and their replacement by housing estates or development projects. A large number of movements and civic associations are emerging, which are trying to prevent the approval of new construction projects or at least make life uncomfortable for developers. It affects people very well when they learn

that they are buying an apartment from a developer, for example, who did not cut down a single tree, or when he planted another 10 somewhere in the area for each one felled.

Construction in Poprad is very limited, especially in terms of space, as it is surrounded by protected areas and national parks. That is why there is enough pressure to renovate and revitalize obsolete or abandoned buildings, as opposed to creating new built-up areas.

2.3 Porter's Competitive Forces

Porter's competitive forces model is an analysis focused on the industry of choice by the organization. It analyses what competitive advantages does the organization possesses and which forces could pose a threat to the organization's position in the market.

2.3.1 Competition in the Industry

There is a fair amount of competition in the development industry. Multiple development projects are currently in progress in the town where our organization is building its current apartment complex. However, these projects cannot compete with the scale of our apartment complex and mostly only one building development. Since the competition is there, our organization is offering its potential customers additional value when they choose to buy an apartment in its complex. Our organization is also backed up by a long history of successful development project completed across Slovakia. This helps our organization to stand out from the competition. There has also been a carefully conducted marketing campaign and brand designed to attract more customers. The housing development industry is currently viewed as stable while providing good value to its customers. Furthermore, with existing barriers to entry into the industry and the inability for one organization to take over the whole market for itself, the current competition in the industry is considered to be at a medium level.

2.3.2 Potential of New Entrants Into an Industry

Organizations seeking entry into the development industry are facing several entry barriers. A stable line of credit has to establish and without references, banks or investors aren't easily persuaded into financing these types of projects. A building development industry is a stable one, with few new competitors emerging every year, but most of the time they

are operating only locally and building single buildings at a time. Our organization has secured a line of credit for a multi-building complex in a hearth of a tourist destination. A new information system will not help create a new barrier to entry, on the other hand, every organization will need to manage their buildings and assets, and investment in a new information system may therefore be viewed as a necessary investment that does pose as a barrier to entry. Consequently, I view the potential of new entrants into the industry as low.

2.3.3 Power of Suppliers

Materials which are needed to build an apartment complex are easily sourceable, from multiple suppliers. The organization is building a large scale apartment complex, which incentives the suppliers to provide more competitive offers as bulk orders are considered more valuable for them. This decreases the power of suppliers. On the other hand, the organization is dependent on these suppliers as it cannot manufacture these materials itself. A new information system will not help decrease this power. Overall, the power of suppliers is medium.

2.3.4 Power of Customers

The housing market in Slovakia can't currently cope with the demand. With locations that are often frequented by tourists and viewed as tourists hubs, there is not enough living space because many inhabitants choose to buy these properties and subsequentially rent them to tourists for a profit. Apart from buying to rent, some customers want to genuinely live in these living spaces. With each customer having a different opinion on what should the space include and how it should look, the power of customers is decreasing. With high demand, there will eventually be a customer who will like the offered space. The power of customers is also decreased by the inability of customers to simply build their apartments with all of the amenities. A new information system can help the organization provide the customers with more choices, and by making its offer more lucrative to customers, their power is decreasing. Therefore, the power of customers is viewed as low.

2.3.5 Threat of Substitutes

Housing is a necessity that can not be substituted. However, since there are multiple competitors in the development industry, a customer can substitute our apartment for an apartment built by another developer. Pricing of the offered apartments has to be chosen carefully, with regards to competitive offers which are currently on the market.

Our organization has chosen to provide additional value to its potential customers and stand out from the crowd of development companies. An apartment showroom has been built in the city, where customers can take a walk around their potential new apartment which is built exactly to the offered standard. This helps the customers to better visualise what they are buying and as a result, more apartments are sold when the customer is willing to come and take a look at the model apartments.

Furthermore, our organization has designed the apartment building to provide multiple amenities which add value. This approach is taken to ensure that customers can't substitute our offered apartments for another and still have the level of service surrounding it. A new information system will provide the organization with the opportunity for better customisation of every offered apartment, while still being manageable. The threat of substitutes would be considered medium/high but with these precautions taken and added value provided, I consider this threat as low.

2.4 7S Analysis

McKinsey 7S framework is used to analyse the internal environment in the organization.

2.4.1 Strategy

The main goal of the organization is to stabilise its place in the real estate market. It aims to achieve this goal by providing its customers with added value and excellent customer care. The organization is backed up by a history of successfully completed projects by its holding company. Therefore, according to the main organization goal, the organization strives to stand up from the crowd of competitors by being a known brand in the field of Poprad real estates.

2.4.2 Structure

The organization has a flat structure, with most of the decisions being decided by its director, although he listens to his employees, who are free to suggest any new ideas regarding their workflow. The organization consists only of essential personnel - sales and accounting departments, which is caused by the early stage of the project. Creative and technical work is outsourced to a creative agency, and long term contracts have been made with the brand strategist and me as I software engineer.

2.4.3 Systems

The organization is not currently using a centralised information system that would act as one source of truth. Furthermore, the employees are dependent only on using spreadsheets with data about the apartments and their availability. This not only reduces the effectiveness but also introduces a range of possible security threats. Since the data are only stored locally on the employee' devices, they could be lost or even leaked if their device gets compromised. Having data available only locally, posed another challenge when we were implementing an interactive model of the apartment building on to the homepage. We haven't had any source of data which haven't required manual updating, we afterwards settled on scraping the old homepage for the needed data.

For interactions with customers, plain emails are used. However, the organization is currently in the process of migrating to a CRM system, which will streamline customer care. This CRM contains features like integrating a mailbox and displaying the complete history of communication with the customer, along with tracking the current stage of the lead.

2.4.4 Shared Values

Employees strive to deliver the best customer experience. It is very important when the customer is deciding about making a purchase as large as an apartment. Since the work is focused on customers, it is paramount that the employees are doing their best when it comes to the interactions with the customers,

The organization shared values therefore are: friendliness, positive attitude, working as a team, being approachable, delivering the best results, rewarding for accomplishments and meeting goals, listening for feedback

2.4.5 Style

The team consists of employees of every age. Teambuilding events organised by the organization are therefore important to promote teamwork across the teams. The management has adopted the democratic style of management, which is appreciated by employees as they feel more involved with the organization. Every employee can express their idea to the director, and when the proposal looks promising, it is implemented. However, the final decision rests on the director.

2.4.6 Staff and Skills

Most of the employees are hardened salespeople. They how to guide the customer through the process of investing in real estate. Skills are shared between employees of the holding company and our organization, which helps with self-development. Other ways in which the organization promotes self-development is by sending its employees to various seminars focused on customer care and sales techniques.

During the pandemic, the employees were able to shift to work from home scheme, during which the sales have dropped, but only by a small amount, although this drop could be caused by a closure of the showroom.

2.5 ZEFIS

The current state of the information systems in the organization is missing some form of organization, as the work is being done in various spreadsheets. This creates an issue where the sales department has to manually update their spreadsheets so they know which apartments are still available to be sold. Another main concern that I have is about data backup and protection since these spreadsheets are stored only locally at each employee' device. This could lead to a security incident if their devices become infected or to a loss of data, in the worst-case damage of the organization's name if the data would be leaked. Finalized contracts are however stored printed and signed by customers.

2.5.1 Effectiveness

The effectiveness of the evaluated information system represents the degree of achievement of desired goals. Desired goals of this information system are properly selected, configured and maintained information system and company processes without inadequacies and errors. This analysis was performed using the ZEFIS tool by comparing the answers given to a specially selected set of questions about the company's processes and the current use of the information system utilization. ZEFIS then compares these responses to industry best practices and provides a score on a scale of 50% to 100%. 50% is the lowest score achievable, as even a misused system has value.

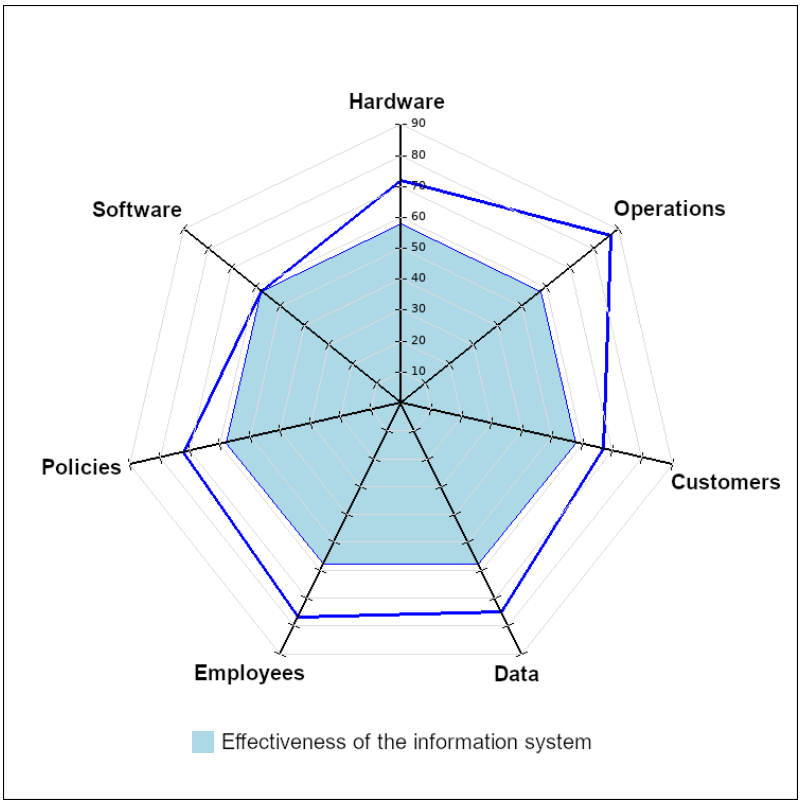

Figure 2.3: Achieved effectiveness score in respective areas
(Source: zefis.cz)

The company's information system achieved a score of 58%, which means that most of the current processes are not in their ideal form. The lowest scoring area is software, which is due to the company's use of diverse software in the company and the lack of rules.

2.5.2 Security

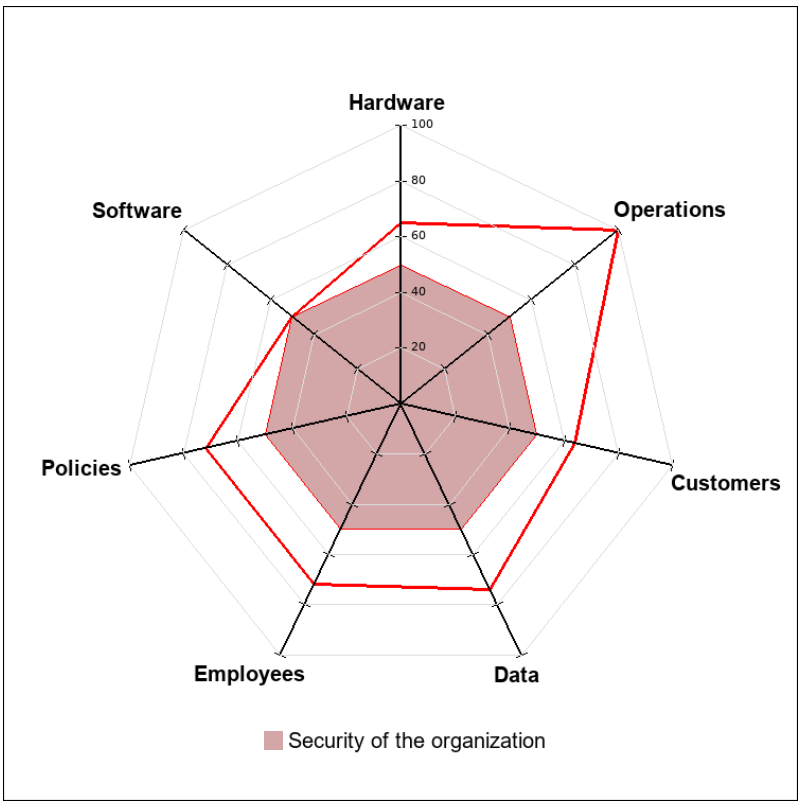

Figure 2.4: Achieved security score in respective areas
(Source: zefis.cz)

The tool ZEFIS pointed to major shortcomings in security. The achieved value is only 50%, which is the lowest possible. This is due to the lack of an IS in which the necessary security measures could be implemented. In the current state, it is not possible to enforce essentially any security policy in connection with data protection, no backup process is set up, employees' devices are also unchecked. The introduction of a central IS should significantly improve this situation. Due to the fact that the company processes personal data of customers, it is also necessary to ensure compliance with applicable legislation and thus prevent possible fines or damage to the company's good name.

2.6 SWOT Analysis

Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis purpose is to consolidate results of conducted analysis of the organization. I have chosen 5 to 6 important points which I believe are affecting the organization.

Table 2.1: SWOT Analysis
(Source: original work)

Strenghts	**Weaknesses**
→ history of successful projects	→ inefficient information system
→ strong branding	→ missing security policies
→ customer service	→ locally stored data
→ marketing campaigns	→ inconsistent data backups
→ repurposing abandoned space	→ missing disaster recovery plan
→ democratic management style	→ weak password policy
Opportunities	**Threats**
→ rising price of real estates	→ data loss due to attack
→ attractive tourist destination	→ less sales during pandemic
→ low interest rates	→ unstable political climate
→ increasing demand for real estates in Poprad	→ limited space for further development in Poprad
→ new trends in smart homes	→ rise of unemployment

2.7 Summary

An analysis of the company's external environment shows that the company operates in a stable market that tends to grow. Economic conditions have so far been favourable, but this may change due to the effects of the current pandemic. An increase in unemployment and a decrease in GDP can cause a decrease in interest in buying real estate and thus also in the company's products. The growth of the average price of real estate over the last 5 years is positive for the company. It is necessary to monitor current developments in the

legislative field, primarily the laws on personal data protection, the environment and the Commercial Code.

The analysis of the industry environment shows that the company is dependent on its supplier - the parent company that carries out the construction. On the other hand, the company operates in a market where customers do not have such strong bargaining power. The company does not have to worry about the new competition, as the barrier to entry is relatively high, but current competition needs to be monitored. The company also has the advantage that there is essentially no long-term sustainable substitute for real estate.

The internal analysis shows that the company tries to keep up with modern companies, whether in the style of leadership and motivation of employees, its structure or the ability to express their views and suggest improvements. The situation needs to be improved especially in the area of systems, where, on the contrary, the company is lagging behind, and it is for this area that I will propose a change in the following design part.

3 PROPOSALS AND CONTRIBUTION OF SUGGESTED SOLUTIONS

In the following section, I will describe the proposed change using Lewin's model. Identify and define the planned change, to evaluate the benefits and examine which areas of the company will be affected by the change. Then I will describe the process of change and divide it into individual phases. I will describe possible risks and propose countermeasures to reduce their impact or probability. At the end of this section will be an economic evaluation.

3.1 System Requirements

This section breaks down the requirements for the information system into three categories. Into each of the intended goal, I added what functions should be provided by the system in order to achieve the set goal.

3.1.1 Organizational Goals

Organizational goals are goals focused on the organization needs and strategy. [4]

- Help to provide customers with excellent customer service
  - Ticketing system for communication with customers
  - Deal stage tracking
  - Contact info, leads details, history of communication
- Building and promoting Karpatska Residence brand
  - Enable sending the newsletter email to subscribers
  - Enable sending news email to subscribers
- Provide more transparency into sales performance for the management
  - Ability to create reports from selected periods
  - Ability to see current deals and their stage

- Provide more transparency into the current offer of available units
  - Track which units are sold, reserved or are available

3.1.2 Technical Goals

Technical goals are goals focusing on covering the technical needs and respective maintenance. [4]

- Decrease time to deploy marketing pages for new development projects
  - Easily add new development project (building) into the system
  - Provide data to marketing pages with API endpoints
  - Accept data from marketing pages with API endpoints
- Improve the overall data management
  - Protect the customer data and comply with the GDPR
  - Maintain data about the units, storage spaces and garages
  - Propose data backup guidelines
- Remove locally stored data from employee' devices
  - Provide archive for the documents

3.1.3 Application Goals

Application goals are covering the needs of the organization regarding process management and support functions. [4]

- Improve the overall efficiency of the processes
  - Remove the need to retrieve and update data in multiple places
  - Generate contracts from templates with the customer details
- Remind employees to contact customers when required
  - Ability to set up reminders to contact the customer
  - Automatic reminder when the deadline for activity is near

3.2 Lewin's Change Model

Lewin's model of controlled change is used to describe the change that would the implementation of a new information system create. I will describe what forces are acting for and against this change, who will be responsible for the realisation, who is the sponsor of this change and what areas of the organization will be affected by the change. The change will be divided into three phases, according to Lewin's model.

3.2.1 Forces Identification and Quantification

It is important to identify which forces are acting on this change. Supportive forces are supporting the change, whereas the resistive forces are opposing the change and they will slow down the change process. I will quantify these identified forces to see if there is enough support for this change.

Supportive Forces

Executing the change will bring benefits in the form of simplifying the processes of individual departments. This will be achieved by unifying current information systems, eliminating the need for looking in multiple places when executing processes. Reducing the administrative load on departments could lead to an increased number of sales thanks to the time savings. Moreover, a new information system will enable better enforcement of security policies and data protection. Overall, the proposed change was welcomed by the employees and management.

Resistive Forces

The largest resistive forces are the entry costs, which will inherently occur while implementing the new information system. Moreover, recurring costs will be created too. I look at the need to train the employees to use the new information system as a resistive force. Some of the employees can be unwilling to change their routines.

Quantification

After identifying the forces that influence the process of change, it is necessary to quantify them. Quantifying these forces provides information about how strong they are, and thereby it is possible to evaluate whether the proposed change has sufficient support

within the organisation. The individual forces are rated on a scale from -5 (most resistant) to 5 (most supportive) with points representing their strength. As the table above shows,

Table 3.1: Forces quantification
(Source: original work)

Supportive Forces	Size	Resistive Forces	Size
Overall process simplification	2	High entry costs	-5
Unification of information systems	2	Recurring costs	-2
Lowering of administrative overhead	3	Need to train employees	-3
Securing confidential data	4	Employee' unwillingness to accept change	-2
Better communication with customers	3		
Sales increase	4		
TOTAL	18	**TOTAL**	-12

the supportive forces predominate with an overall strength of 18 points, while the resistant forces are only about -12 points strong. Therefore, the proposed change has sufficient support for its implementation.

3.2.2 Agent of Change

The agent of change will be an external organization, as the organization itself does not have the resources needed to implement a new information system. This external organization will be responsible for executing the change, as support from the company, several employees have been assigned to work with the company so the processes can be created as close to the original as possible.

3.2.3 Sponsor of Change

The sponsor of change is the director of the organization. Since the director has to sign the contracts and has the final say in approving the change.

3.2.4 Intervention Areas

Human Resources

This area will be indirectly affected. The change has no plan of creating tools to manage human resources. Some processes may, however, change which will enable better insight into the performance of the individual employees with relation to the sales, or customer service.

Organizational Structure

The organizational structure will not be changed as a result of implementing the change. However, it may be better enforced, as the access to individual resources will be set according to the structure.

Technologies

Implementing the change will not affect the products which are currently offered by the organization. However, the customer service that the organization is offering to its customers, can be viewed as a product too. The level of provided customer service will be changed as a result of the implementation, by providing more efficient tools to the employees.

Communication and Information Flow and Processes

This area is the one that the change primarily targets. The change aims to improve the overall efficiency of the current processes.

3.2.5 Process of Change

Unfreezing Phase

In this phase, it is important to gather support from the organization to implement the change. Employees have their habits and routines, which however have to change. For the change to bring proposed benefits, the employees have to use the new information system.

This phase will therefore be used to gather the required information about the employees, processes and organization. Policies for protecting personal data should be created

and a rough proposal of functionality should be refined so it can be approved at the start of the next phase.

Change Phase

The execution. According to the approved proposals, the work on the system starts. The agent of the change will execute the change with support from the sponsor and the assigned employees. At the end of this phase, a tested and working information system with migrated data will be delivered and the employees trained to use it.

Refreezing Phase

After successful test operation and incorporation of the identified deficiencies, the system will be taken over together with the documentation from the external company and put into operation. At the same time, it will be possible to evaluate the implementation of the change at this stage.

Verification of Achieved Goals

It is important to verify that change brought desired results. We cant however compare specific metrics like increased number of sales because the demand is not constant. The organization can measure how much time is saved in the execution of individual processes, ask employees to fill out a questionnaire about the system and if they are satisfied with it.

3.3 Risks

In this chapter, I will focus on identifying possible risks, which could impact the successful implementation of change in the organization. I will then quantify these risks and propose what measures could be taken to reduce the probability of their impact.

The identified risks were scored on a scale shown in Table 3.2 and Table 3.3. Their value is calculated as a product of their probability of occurrence and impact.

The map shows that the risks are mostly medium to high impact. The probability of their occurrence ranges from low to medium.

Table 3.2: Risks probability values
(Source: original work)

Probability	Value	%
Improbable	1 - 2	< 20%
Low	3 - 4	21 - 40%
Probable	5 - 6	41 - 60%
More probable	7 - 8	61 - 80%
Highly probable	9 - 10	81% <

Table 3.3: Risks impact values
(Source: original work)

Impact	Value
Minimal	1 - 2
Negligible	3 - 4
Significant	5 - 6
Substantial	7 - 8
Critical	9 - 10

Table 3.4: Identified risks and their value, their probability (P) and impact (I)
(Source: original work)

Risk #	Risk	Scenario	P	I	Risk value
R1	Exceeding the allocated budget	Implementation revealed the need for more functionality	4	5	20
R2	Not meeting project deadline	Delayed commissioning of the system	4	4	16
R3	System inefficiency	Missing functionality	2	7	14
R4	System unavailibity	Employees cannot work	5	9	45
R5	Deletion of data in the system	Employee deleted data by mistake	3	7	21
R6	Change in the data regulations	Need to adapt the system to conform to the new regulation	1	6	6
R7	System failure	Loss or corruption of data	3	8	24
R8	Integration system not reachable	System provides none or only limited functionality	2	6	12
R9	Unauthorized entry to the system	Breach of data confidentiality	6	10	60
R10	Unauthorized access to the data	Employee accessed confidential data	5	5	25

In the following web graph we can observe the impact of the proposed measures on the value of individual risks. The risks that had the highest initial value - R9 and R4 - could be significantly reduced by appropriately chosen measures. The chosen measures therefore have a visible effect on the values, but it is still necessary to monitor the risks described.

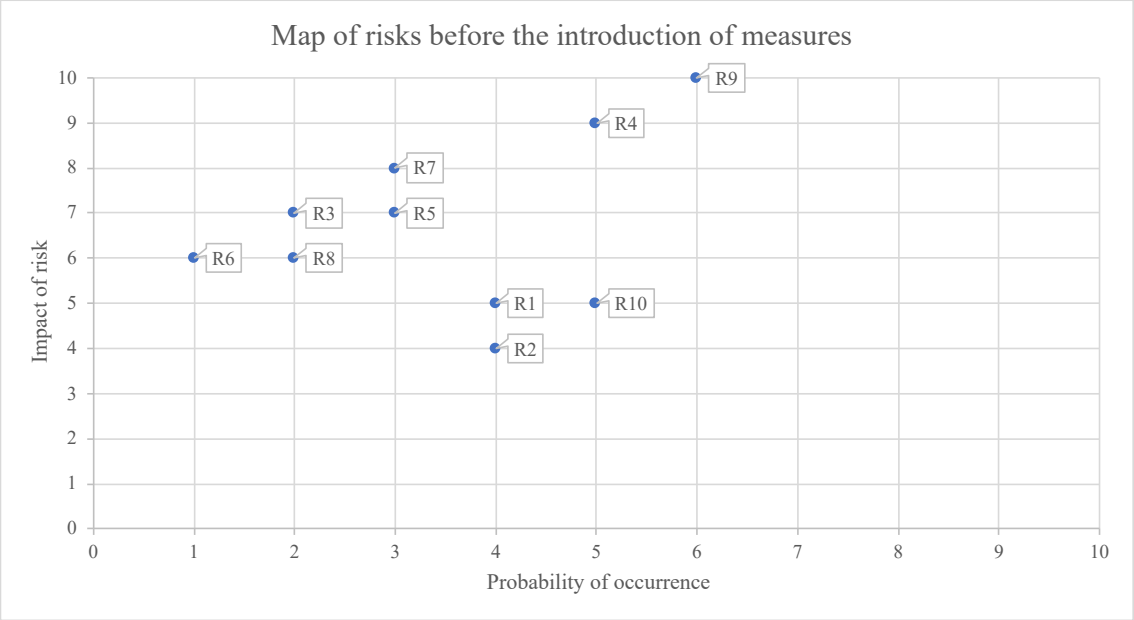

Figure 3.1: Map of risks before the introduction of measures
(Source: original work)

Table 3.5: Proposed measures to reduce the value of risks
(Source: original work)

Risk #	Proposed measure	P	I	Risk value
R1	Increase the time budget for analysis, consult changes with the sponsor of the change	2	3	6
R2	Periodical progress meetings	2	2	4
R3	Increase the time budget for analysis	1	7	7
R4	Deploy the system on reduntant infrastructure or cloud solution	1	9	9
R5	Periodical data backup, store history of changes	3	1	3
R6	No measure, accept the risk	1	6	6
R7	Periodical data backup	3	1	3
R8	Retain basic functionality in case of the integrated system is not reachable	2	2	4
R9	Harden the system, implement multifactor authentication, create password policy	1	10	10
R10	Ensure data access is granted per role of the user, implement permissions system	1	5	5

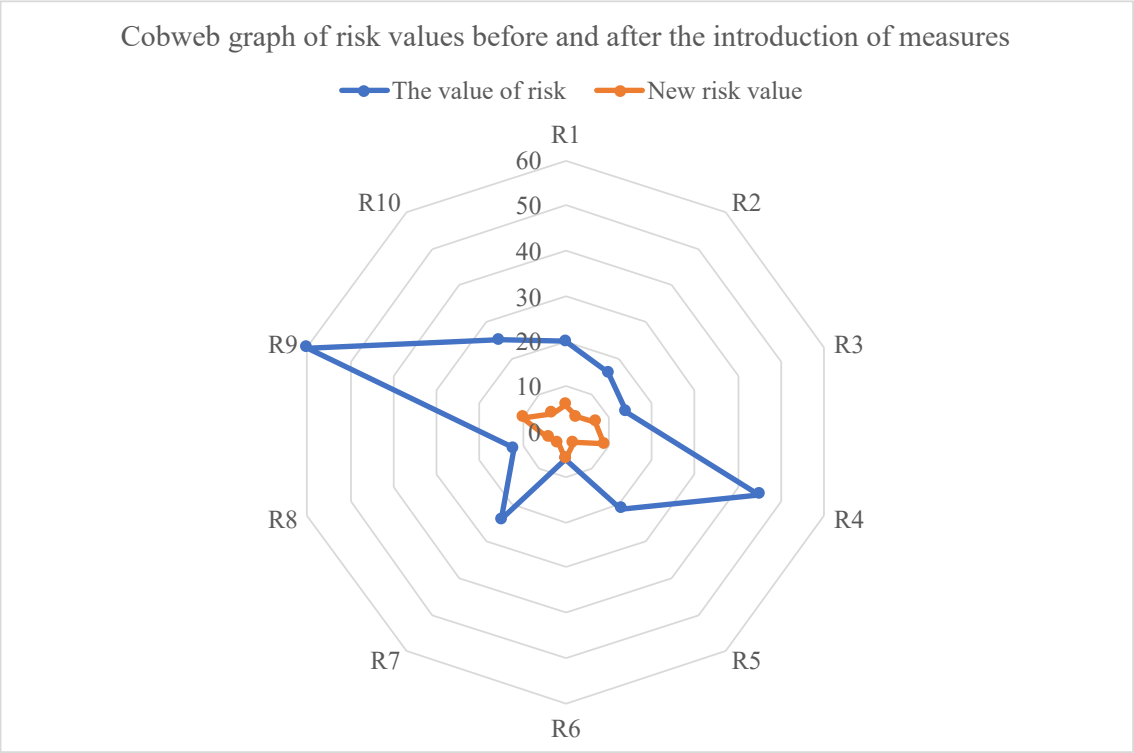

Figure 3.2: Web graph of risk values before and after the introduction of measures
(Source: original work)

3.4 Time Schedule

To create a project schedule a PERT method is used, which allows working with a stochastic approach to activities and thus can estimate the duration of the project, although we do not know the exact duration of activity. After calculating the time slack of individual activities according to their hierarchy, and calculating their possible starts a network graph will be created. This graph shows the activity chain, along with a critical path, which consists of activities without any slack. Therefore critical activity is delayed it will delay the whole project.

Duration

$$t = \frac{a + 4m + b}{6}$$

The expected duration of activities is calculated as a weighted average of their optimistic, pessimistic and probable durations.

Dispersion

$$\sigma^2 = \frac{(b - a)^2}{36}$$

Dispersion gives us variability of individual values of pessimistic and optimistic estimates of activity durations.

Standard Deviation

$$\sigma = \frac{b - a}{6}$$

The standard deviation tells us how much the individual estimates of pessimistic and optimistic duration differ from each other.

Table 3.6: PERT time analysis of activities
(Source: original work)

Ordered chain of activites				Duration [MD]				Statistical indicators		Start and end of activities				Slack
Activity	**Activity description**	**i**	**j**	**a**	**b**	**m**	**t(ij)**	**σ2**	**σ**	**ES**	**EF**	**LS**	**LF**	**S**
A	Consultation with external company	-	B,C	2	7	4	*6*	0.69	0.83	0	6	0	6	0
B	Analysis of company processes	A	D	2	6	3	*5*	0.44	0.67	6	11	6	11	0
C	Evaluate personal data protection policies	A	D	1	3	2	*3*	0.11	0.33	6	9	8	11	2
D	Design of functionality	B,C	E	4	9	7	*8*	0.69	0.83	11	19	11	19	0
E	Approve proposed changes, sign contract	D	F,H,I	0.5	2	1	*2*	0.06	0.25	19	21	19	21	0
F	Graphical design of the system	E	G	5	10	8	*9*	0.69	0.83	21	29	32	41	12
G	User interface programming	F	K	4	8	6	*7*	0.44	0.67	29	36	41	48	12
H	Programming of functionality	E	J	15	24	20	*22*	2.25	1.50	21	43	21	43	0
I	Preparation of the infrastructure	E	K	3	8	5	*7*	0.69	0.83	21	28	41	48	20
J	System integration	H	K	2	6	4	*5*	0.44	0.67	43	48	43	48	0
K	Verification of compliance with legislation	G,I,J	L,N	1	3	2	*3*	0.11	0.33	48	51	48	51	0
L	Creating users	K	M	1	3	2	*3*	0.11	0.33	51	54	51	54	0
M	Setting access rights	L	O	1	3	2	*3*	0.11	0.33	54	57	54	57	0
N	Migrating existing data	K	O	2	5	4	*4*	0.25	0.50	51	55	53	57	2
O	System testing	M,N	P	5	10	8	*9*	0.69	0.83	57	66	57	66	0
P	Repair of deficiencies detected	O	Q	1	10	5	*8*	2.25	1.50	66	74	66	74	0
Q	User training	P	R	1	3	2	*3*	0.11	0.33	74	77	74	77	0
R	Putting a system into operation	Q	S	2	7	4	*6*	0.69	0.83	77	83	77	83	0
S	Handover of the system and documentation	R	-	1	3	2	*3*	0.11	0.33	83	86	83	86	0

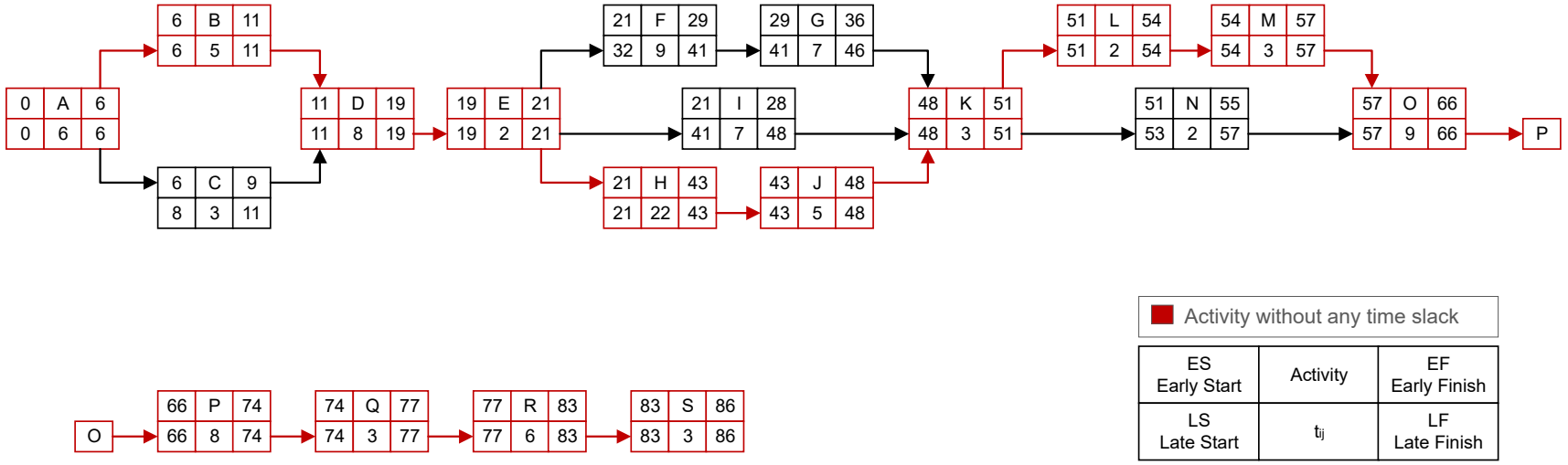

Figure 3.3: Network graph of activities with critical path
(Source: original work)

The time analysis helped identify which activities are considered to be critical, e.g. without any time slack. These are the activities A-B-D-E-H-J-K-L-M-O-P-Q-R-S. However, the single most time-consuming activity is the programming of the functionality, optimistic expected duration is 15 man-days (MD), pessimistic is 24 MD. As this is the core activity, the progress of this activity should be periodically checked to ensure a timely finish. With the chosen implementation approach there are not many activities that be run simultaneously. Moreover, the majority of activities cannot start without input from their predecessor.

3.5 Processes

3.5.1 Apartment Sale

This process is internally divided into 3 smaller processes - reservation, contract for future contract and approval - due to the fact that there is a large time gap between them.

Creating a Reservation

Currently, the main activity of the company is the sale of emerging apartments and premises. The sale of the apartment is a complex process with multiple stages. First, it is necessary to help the customer with the selection and show him the model apartments, which are built according to the visualizations on the website. If the customer is interested in buying, it is necessary to choose a specific apartment, which is still available. The customer will also have the opportunity to purchase a cellar and a parking space in the garage. If everything is in order and the seller has chosen suitable premises for the customer, the reservation contract will be signed. From the signing of the contract, the customer has 7 days to pay the reservation deposit in the specified amount. If he does not have time to pay, the reservation is cancelled and the contract is invalid. Otherwise, the reservation is considered binding and further steps will follow.

Table 3.7: RACI matrix of responsibilities for the sale process
(Source: original work)

Activity description	Customer	Sales representative	Accounting
Identification of customer's needs	C	R,A	
Tour of model apartments	C	R,A	
Set up next meeting or contact date	C	R,A	
Contact with the customer	C	R,A	
Selection of desired unit	C	R,A	
Sign reservation contract, mark unit as reserved	C	R,A	
Deposit payment	R,A		I

Equipment and Binding Contract

The next step is to choose the equipment of the apartment, as the apartments are delivered already furnished - bathroom, kitchen, windows, etc. The equipment must be selected within 6 months of signing the reservation contract, as a future contract must be signed

within 6 months, where the equipment is specified. After signing this contract, it is necessary to pay 20% of the total price of the purchased space. After payment, only the physical completion of the building and its approval are awaited. The remaining 80% of the total price must be paid upon approval.

Handover

The customer is expected to pay the rest of the price at the moment of handover. The customer will receive an equipped unit according to the agreement. A protocol is signed which contains serial numbers and the initial state of energy trackers for water, gas and electricity. The sale of the apartment is now complete.

3.5.2 Communicate with Marketing Pages

We encountered this problem when we creating a marketing page for the new development project. There was not a source of data about the apartments. Therefore these data had to be periodically scraped from the company website, where they were updated manually. This introduced a few issues since the new marketing page was deployed into production. The new system will speed up this process, by providing an API endpoint that will provide these data to the marketing pages, therefore saving on costs of the new marketing pages and providing more convenience to both parties - the developers and employees.

When a customer signs up for a newsletter, fills out a form request for a meeting or sends a general inquiry through the marketing page, several emails are sent, and the result is that the data are lost. The customer will get a reply with the meeting, but afterwards, information about this lead is not saved. The proposed system should work as a „data storage“ for the marketing pages. These pages would send an API request after customer input and the system will then add the customer to a newsletter list, or create a new lead in the CRM system.

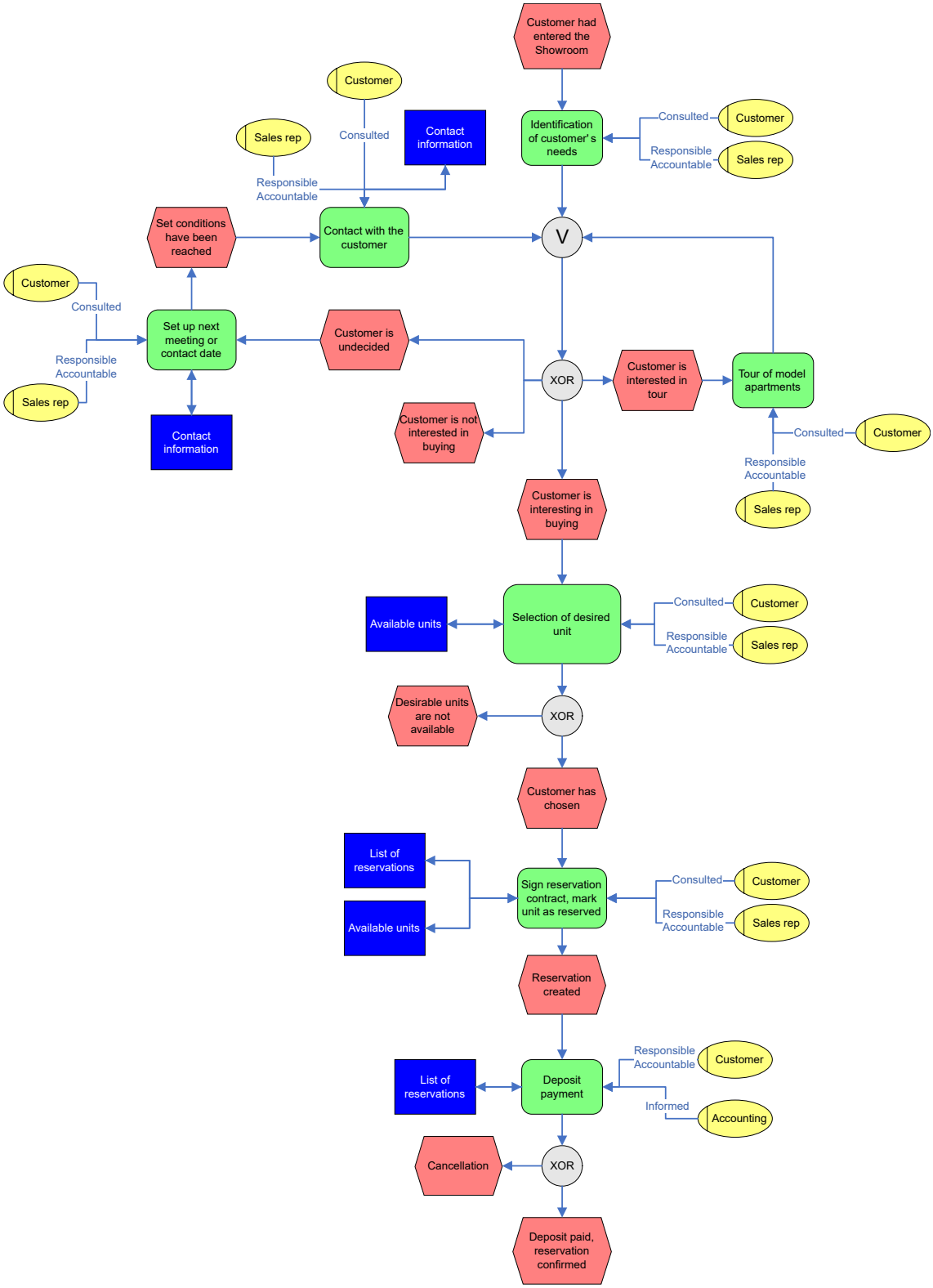

Figure 3.4: EPC diagram of the sale process
(Source: original work)

3.5.3 Document Generation

Currently, when an employee needs to sign a contract with the customer, it is needed to manually fill out all of the customer details. These documents are however the same for every customer. The system should allow for setting up templates for these documents, which will then be prefilled with the customer and apartment data when the employee has to sign it. This will provide considerable time savings since the employee won't have to manually fill out the customer information, and also there will not be a need to fill out the same information about the customer later into the ownership records.

3.5.4 Customer Support

Customer support will be improved by consolidating all of the required information about the customer in one screen. Moreover, the CRM system will be configured to fetch emails from the email server and display them directly in its interface. This will enable the employee to reply directly within the CRM system. The CRM system will then send an email to the customer via the company email server. Organizing the support cases into tickets can help when multiple employees have to respond, as they will all see the history of communication with the customer.

3.5.5 Marketing Activities

Sending a newsletter, or publishing news to the marketing pages is currently a task for the developers of the marketing web pages. By including the logic in the system, an employee send a newsletter to all of the subscribed customers via the proposed system. Similar behaviour will occur when an employee wants to publish news on the pages. By exposed API endpoints, all of the marketing pages will display the newly published news. This will be more convenient to the employees as they will not need to contact developers with these tasks.

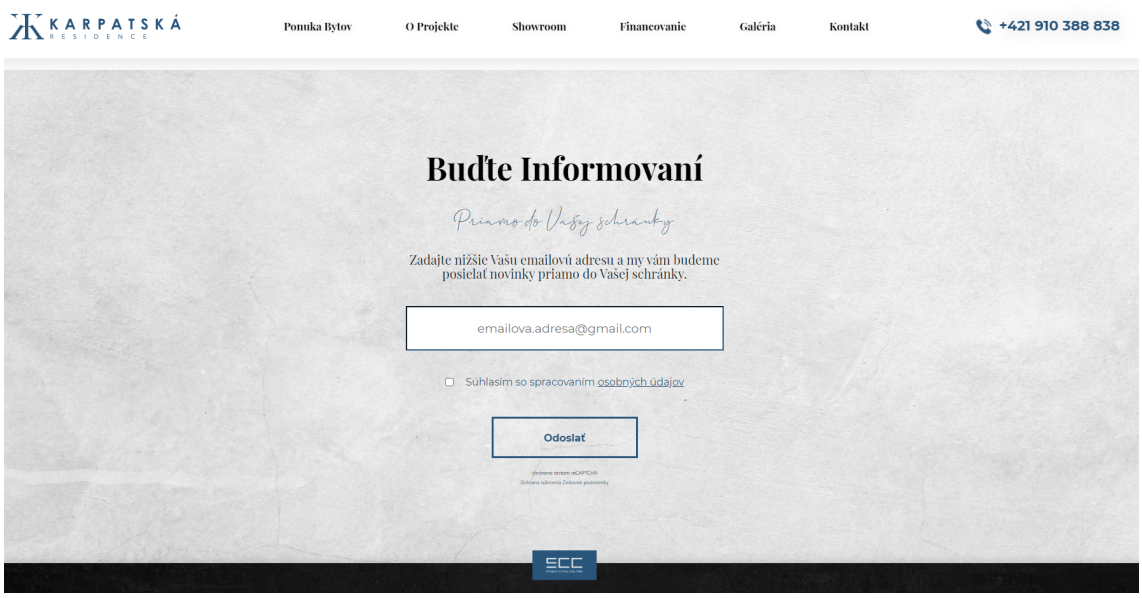

Figure 3.5: Newsletter subscribe form
(Source: [1])

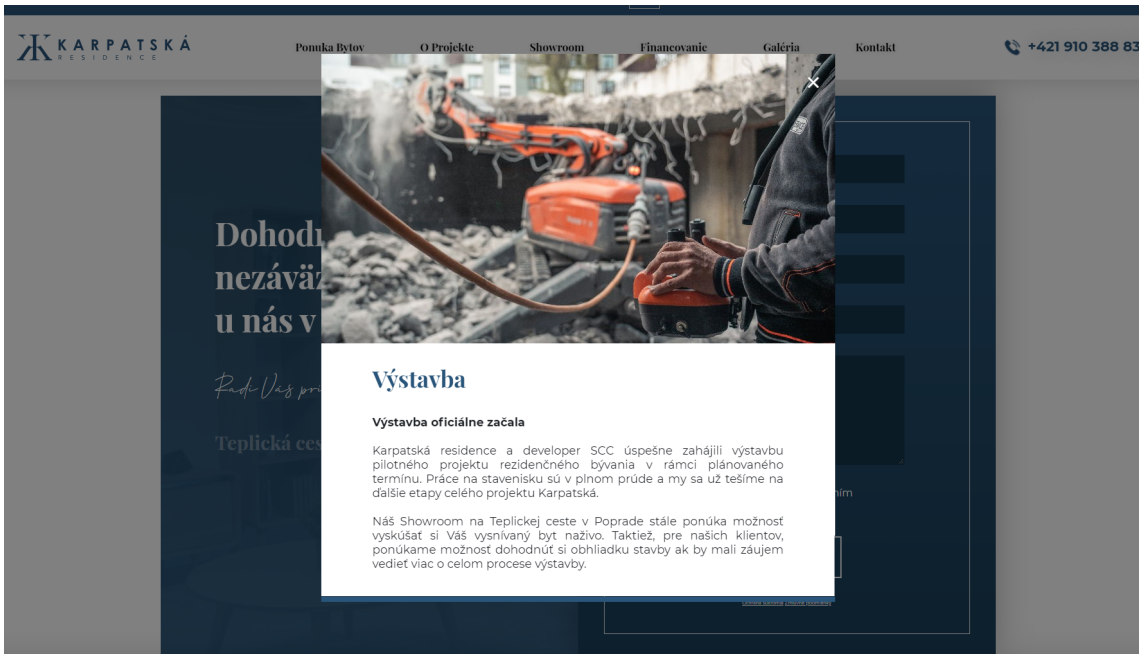

Figure 3.6: Example of displayed news on the site
(Source: [1])

3.6 Proposed Solution

I see the main problem as the unsatisfactory current state of IS, as it is only Excel workbooks. This creates many shortcomings, as also shown in the analysis. Therefore, I am proposin a custom information system with external integrations, according to their requirements, so that the processes can be managed more efficiently. To save costs, it is possible to select and integrate an independent CRM system that provides access to the API, saving resources and time spent building such additional functionality. The CRM system can be used as a database of clients, when signing the contract - resp. change in the relationship with the company - these data will be stored in their final form in the new IS together with the necessary contracts. This will allow the company to comply with the protection of personal data, as sensitive data will be located in the controlled environment of the company and in the external CRM system to maintain only the basic personal data necessary for communication with the client. Currently, the client is required to give consent so that his personal data can be processed.

3.6.1 CRM System

The CRM system for the company must meet the following requirements:

→ Contain a database of contacts / clients

→ View the history of communication with the client

→ Ability to track at what stage of the sale the client is

→ Automatically download and assign communication from email to clients

→ Open API to enable integration into proposed information system

→ Access for multiple users and their division into individual roles

The HubSpot CRM system is a comprehensive All-in-One CRM system that has several modules. These modules can also be purchased separately and provide specific functionality according to the focus of each module. So if we do not opt for a comprehensive solution, we can buy a CRM system where we will not pay for functionality that we will

not use. All CRM systems that HubSpot offers - in addition to a comprehensive „Full CRM“ - also have a plan that is free.

For the needs of our company, a good solution is the Sales Hub system, which in addition to basic CRM functionality also provides functions that support sales - such as Live chat, sending offers and „Deal pipeline“ - the ability to configure sales stages and monitor individual stages currently located.

From other system requirements, we can also find the option to link the email to the Sales Hub - so that incoming emails are displayed and assigned directly to the contact in the CRM system. This will save time for sellers, as they will have all the information in one place and can respond directly to the customer without having to open an email inbox.

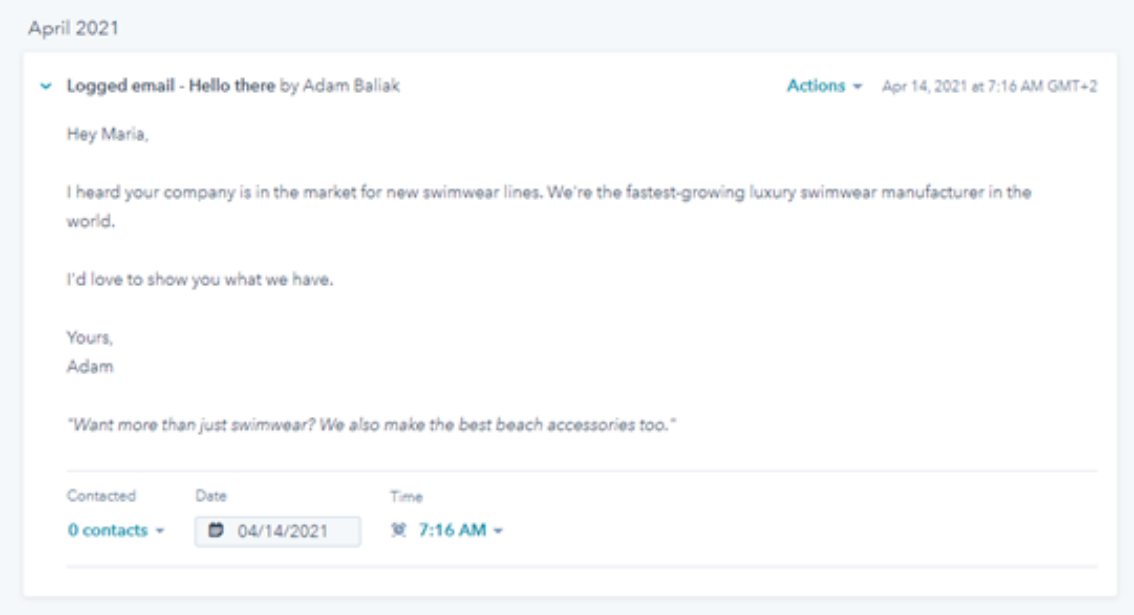

Figure 3.7: View of the contact detail and activity in the SalesHub
(Source: original work)

The contact detail contains all the information that is relevant for the seller. On this page, the seller has the opportunity to change all the properties of the contact, the stage at which he is, when he was last contacted, etc. In the middle there is a complete activity with the given contact, his communication with the seller, changes in his properties, etc. This activity can be filtered according to what the seller is interested in.

HubSpot does not limit the number of users in the free version. Adding them to the team is easy and import using CSV is also supported. It is also easy to set where each user has access.

3.7 System Architecture

In terms of architecture, it is an application with a thin web client, the logic of the application will be stored and executed on servers. The application should provide several API points to be able to communicate with other systems. I do not describe these points or the data structure in more detail, they will be designed by the system implementer according to the functionality proposal.

In the following the figures is shown an overview of the system environment, its users and external systems which will communicate with the system.

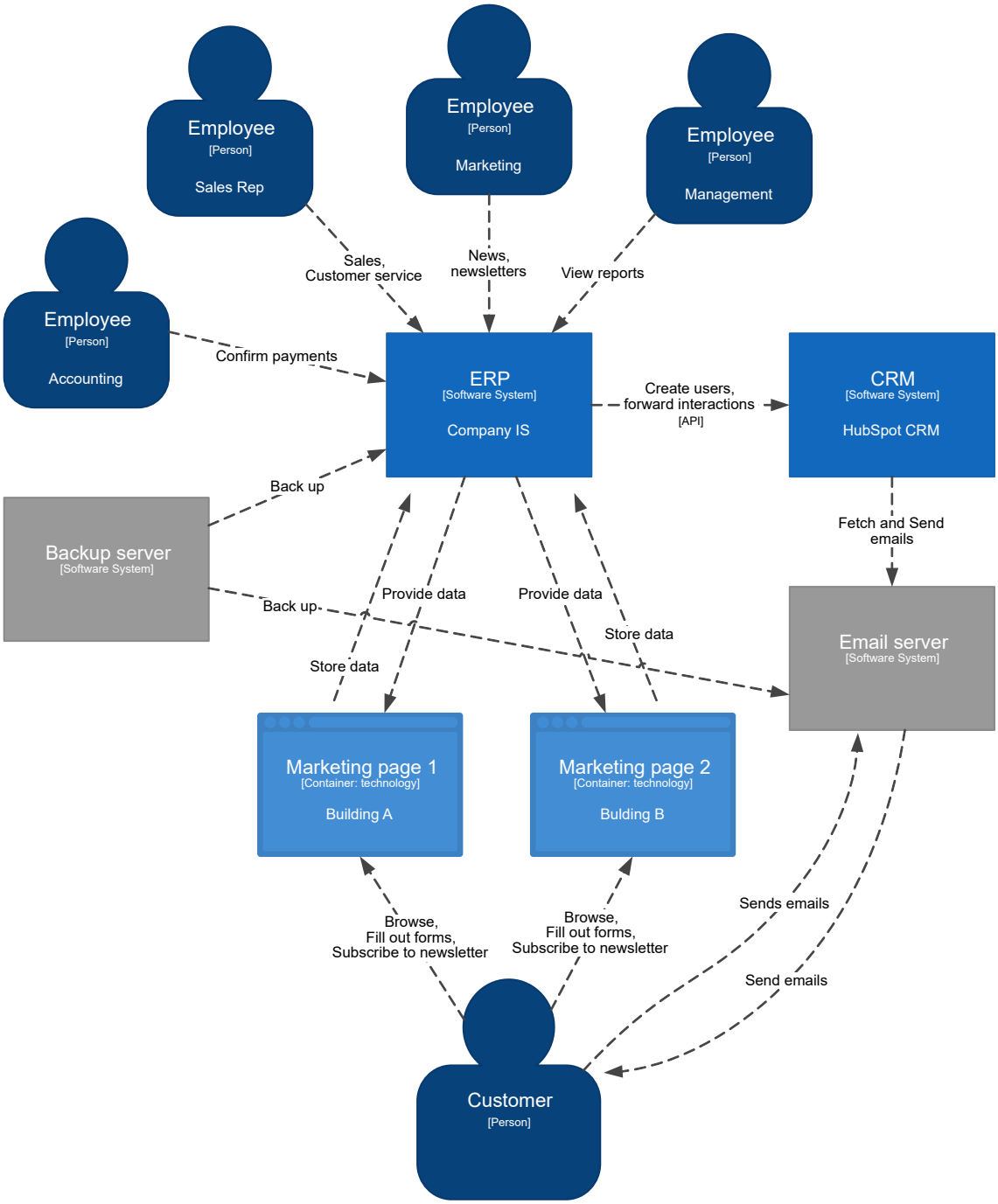

Figure 3.8: System architecture overview
(Source: original work)

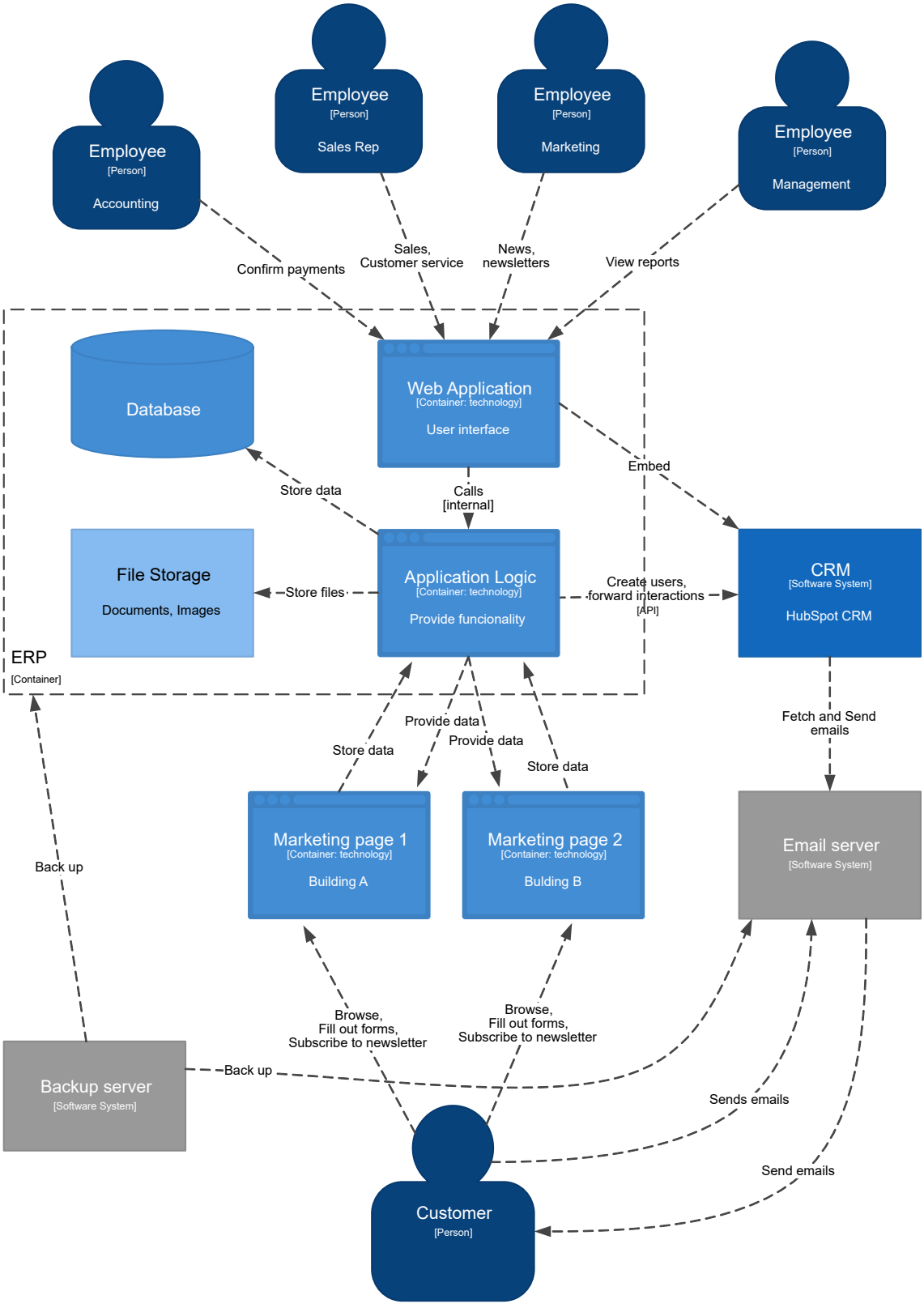

Figure 3.9: Detailed system architecture overview
(Source: original work)

3.8 Implementation Strategy

The proposed information system will be implemented according to the time schedule. However, after selecting a suitable CRM system, data will be migrated from existing work databases - Excel workbooks - and unified. User training will follow. After training the users, only a new solution will be used to communicate with clients. The proposed solution will be implemented in the company using an impact strategy, as together with the commissioning of the new solution, the old solution will cease to be used.

3.9 Security Considerations

When designing a new system, it will be necessary to design and set security rules. They determine who has access to what data, where that data is stored, how it is backed up, and how it will be protected. Creating these rules will eliminate almost all identified security deficiencies. In the new IS, it will be possible to divide the data into different categories and define who can work with them and display them - we will divide the users into groups and then set access rights for these groups. The data will be stored in two places, in the CRM system and in the new IS on the company's servers. Once created, the backed up data should be encrypted and stored in at least 2 geographically separated locations. As a key to access this data, I recommend generating a new certificate and use the public part for encryption. The private key should be available to employees who, in the event of a failure, would be responsible for restoring the system to operate.

The new IS does not directly address the need to set a computer software policy or restrict Internet access. In this case, however, it will help, as the data will not be located directly on employees' facilities. It will also be appropriate if users are trained on different types of attacks, especially before the so-called „Phishing" attacks, which are popular at this time.

3.9.1 User Authentication

To meet one of the essential security objectives, there should be a robust authentication system implemented. First, require users to use a strong password, consisting of multiple types of characters - letters, numbers and special characters. Then enforce a password

change every 3 to 6 months. Another good measure is to require multifactor authentication (2FA). This could be set up by either using an SMS gateway to send one-time-password (OTP) codes or generating them with a 2FA app such as Google Authenticator or Authy. Implementing 2FA will prevent unauthorized access into the system in case the user's passwords gets compromised. Lost passwords or authenticator should be only reset by an employee with administrator permissions, after verification of the user.

3.9.2 Data backup

Moving from locally stored data on employee' devices will allow us to properly back up system data. There should be multiple versions of backups, for the database and file storage, I suggest using an hourly backup interval. After the creation of backup, this backup can be store both locally and also copied to the backup server where it will be stored for a longer period. This period - the retention - should be set accordingly to current needs. At this stage, I would suggest using a retention period of three weeks for daily backups and one week for hourly backups. After a successful copy to the backup server, they can be removed from the application server. This process should be automated, but periodically checked that it behaves correctly, along with the backups.

3.9.3 Data protection

Backups stored on the backup server should always be stored encrypted. They should be encrypted before copying to the backup server, with the public key stored on the application server. The private key which has to be used to decrypt these backups should be stored with the administrator, and be accessible to employees that will be recovering the system in case of failure. Access to the backup server should be limited only to the IP addresses of the application and email server, and also the IT department, or a possible recovery site from which will be system recovered after a failure.

To conform with GDRP it is needed to provide evidence of best efforts to the regulator. Apart from encrypting data at rest and ensuring only authorized access to the system, another viable way is to reduce the amount of personal data which is collected and stored about the users. Any logs which contain these sensitive data should therefore be anonymized before collection.

3.9.4 Log policy

To provide accountability in the system, every action performed in the system should be logged. In the case of the data in the system, a revisioning system can be implemented, which will show the history of changes and the person responsible for those changes. In case of mistakenly deleted data, this will provide users with a means to recover the data by themselves, therefore reducing the support load.

3.10 Economic Considerations

The proposed change will bear substantial costs. However, we need to consider that the company current state of information system, especially in the area of data protection was next to none. Therefore an investment in a system that could help reduce the risks associated, will be worth it over time. The improvement in the processes are discussed in the Section 3.5.

Table 3.8: Costs breakdown
(Source: original work

Activity	Duration [hrs]	Rate [€/hod]	Cost
Consultations	40	25 €	1,000 €
Design and implementation	400	25 €	10,000 €
User training	8	40 €	320 €
Operation	1 year	-	1,200 €
			12,520 €

CONCLUSIONS

As a solution, the company will be recommended a new custom IS and a CRM system from HubSpot called Sales Hub in a version that is free. This system meets all the requirements that have been placed on the system and its advantages include the fact that it can meet them without incurring additional costs for the company to operate. It is well extensible, has a clear environment and good integration. The combination of these two solutions will reduce overall costs. In addition, the CRM system can be put into operation in the company before the completion of the new IS.

The proposed solution will allow more efficient use of time by sales departments. Resellers will have all the necessary client information available in one place, along with a history of communication with individual clients. This eliminates the need to manually search for the necessary client information. The selected CRM system supports integration into the new corporate IS. The demonstration of the system to the sales department - when identifying the requirements - met with positive feedback, as it will simplify their workflow.

The implementation of the proposed solution will also eliminate significant shortcomings, especially in the field of security. It will be possible to ensure data protection, backup and deletion of local data from employees' devices. At the same time, however, this system does not eliminate the need to set a security policy in the company, nor the appointment of a security manager. Investing in security and better IS is also an investment that, in addition to improving efficiency, can prevent damage to the company's reputation in the event of a data leak.

BIBLIOGRAPHY

[1] Homepage. *Karpatská Residence* [online]. Poprad: Karpatská Residence. 2020. Retrieved from: https://karpatskaresidence.sk

[2] Banková úroková štatistika - úvery. *Národná banka Slovenska* [online]. Bratislava: Národná banka Slovenska. 2021.
Retrieved from: https://www.nbs.sk/sk/statisticke-udaje/financne-institucie/banky/statisticke-a-analyticke-prehlady/urokova-statistika/bankova-urokova-statistika-uvery

[3] BASKARADA, S.; KORONIOS, A.: Data, Information, Knowledge, Wisdom (DIKW). *Australasian Journal of Information Systems*. vol. 18, no. 1. 2013: pp. 5–24. ISSN 1449-8618. doi:10.3127/ajis.v18i1.748. [Online, accessed on 21.02.2019].
Retrieved from: https://dx.doi.org/10.3127/ajis.v18i1.748

[4] BASL, J.; BLAŽÍČEK, R.: *Podnikové informační systémy : podnik v informační společnosti*. Management v informační společnosti. Praha: Grada. third edition. 2012. ISBN 978-80-247-4307-3.

[5] BRUCKNER, T.: *Tvorba informačních systémů : principy, metodiky, architektury*. Management v informační společnosti. Praha: Grada. first edition. 2012. ISBN 978-80-247-4153-6.

[6] CURTIS PRESTON, W.: *MODERN DATA PROTECTION : ensuring recoverability of all modern workloads*. Sebastopol: O'Reilly Media, Incorporated. first edition. 2021. ISBN 9781492094050.

[7] HANAFIZADEH, P.; RAVASAN, A. Z.: A McKinsey 7S model-based framework for ERP readiness assessment. *International Journal of Enterprise Information Systems (IJEIS)*. vol. 7, no. 4. 2011: pp. 23–63. doi:10.4018/jeis.2011100103.
Retrieved from: https://doi.org/10.4018/jeis.2011100103

[8] KOCH, M.: *Metoda HOS* [lecture]. Brno: Vysoké Učení Technické. 13.04.2021.

[9] LEBLANC, J.; MESSERSCHMIDT, T.: *Identity and Data Security for Web Development*. Sebastopol: O'Reilly Media, Incorporated. first edition. 2016. ISBN 9781491937013.

[10] MANUEL, P. D.; ALGHAMDI, J.: A data-centric design for n-tier architecture. *Information Sciences*. vol. 150, no. 3. 2003: pp. 195 – 206. ISSN 0020-0255. doi:10.1016/S0020-0255(02)00377-8. [Online, accessed on 10.04.2019].
Retrieved from: https://doi.org/10.1016/S0020-0255(02)00377-8

[11] MATHER, T.: *Cloud security and privacy*. Beijing Cambridge Mass: O'Reilly. 2009. ISBN 9780596802769.

[12] NEZMAR, L.: *GDPR : praktický průvodce implementací*. Právo pro praxi. Praha: Grada Publishing. first edition. 2017. ISBN 978-80-271-0668-4.

[13] ORAM, A.; WILSON, G.: *Beautiful code*. Theory in practice. Sebastopol: O´Reilly. 2007. ISBN 978-0-596-51004-6.

[14] ORIYANO, S.-P.: *Cehv9 : Certified Ethical Hacker Version 9*. New York: John Wiley and Sons, Incorporated. 2016. ISBN 9781119252245.

[15] ŠPROCHA, B.; BLEHA, B.; GARAJOVÁ, A.; et al.: *Populačný vývoj v krajoch a okresoch Slovenska od začiatku 21. storočia*. Bratislava: INFOSTAT - Výskumné demografické centrum. 2019. ISBN 978-80-89398-38-6.

[16] SMEJKAL, V.: *Řízení rizik ve firmách a jiných organizacích*. Expert (Grada). Praha: Grada. fourth edition. 2013. ISBN 978-80-247-4644-9.

[17] SODOMKA, P.: *Informační systémy v podnikové praxi*. Brno: Computer Press. second edition. 2010. ISBN 978-80-251-2878-7.

[18] SPAHO, K.: 7S Model as a framework for project management. *Economic and Social Development: Book of Proceedings*. 2014: page 450. doi:10.4018/jeis.2011100103.
Retrieved from: `https://doi.org/10.4018/jeis.2011100103`

[19] SRPOVÁ, J.: *Podnikatelský plán a strategie*. Expert (Grada). Praha: Grada. first edition. 2011. ISBN 978-80-247-4103-1.

[20] STALLINGS, W.: *Cryptography and Network Security: Principles and Practice, Global Edition*. Harlow: Pearson Education Limited. 2016. ISBN 9781292158587.

[21] SVOZILOVÁ, A.: *Projektový management : systémový přístup k řízení projektů*. Praha: Grada Publishing. third edition. 2016. ISBN 978-80-271-0075-0.

[22] TASR; HABAS, J.: *Nezamestnanosť na Slovensku: mapa, grafy, vývoj*. Bratislava: Ekonomika SME. 2021.
Retrieved from: `https://ekonomika.sme.sk/c/22429391/nezamestnanost-na-slovensku-vyvoj-grafy-maj-2020.html`

LIST OF FIGURES

LIST OF TABLES